Electrical Review

With Which Is Consolidated WESTERN ELECTRICIAN and ELECTROCRAFT.

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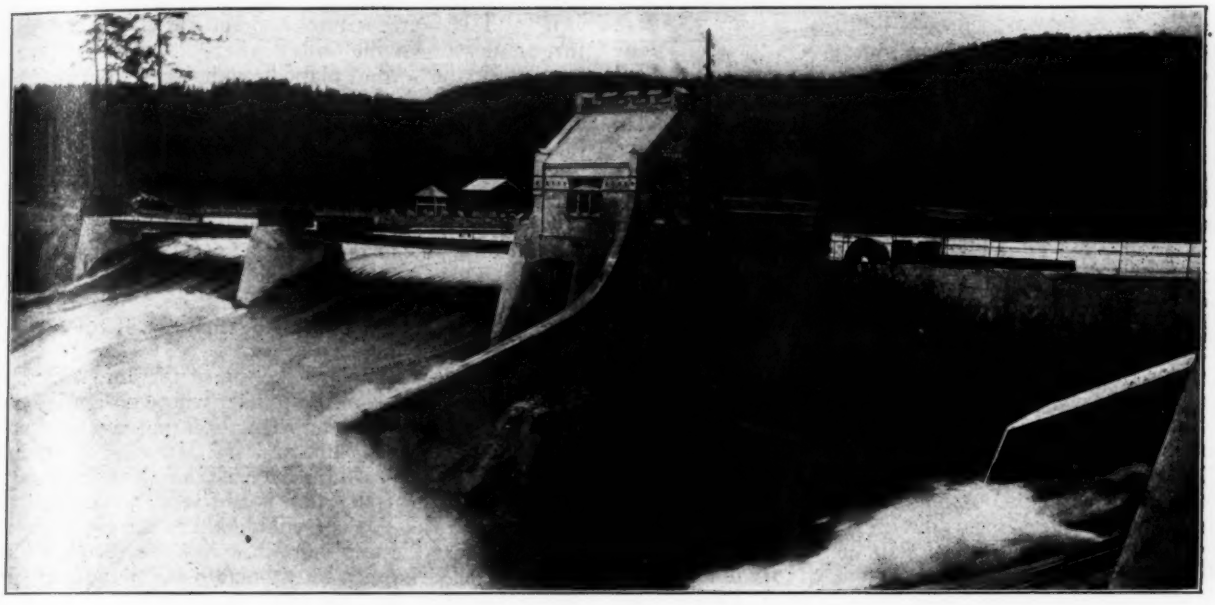


Dam for Hydroelectric Plant at Svaelgfos, Norway.

Hydroelectric Power for Fixation of Nitrogen—A War Asset

Fixation of Atmospheric Nitrogen Accomplished on Large Scale in Norway by Using Water Power—The Electrical Process Used—Excellent Example for America

NITROGEN is an important element in winning the war, first, because of its use in explosives and, second, because of its use in fertilizers. Thus it is an essential constituent of cannon food and is also needed to produce soldiers' food. The atmosphere furnishes an inexhaustible supply of free nitrogen, but unfortunately we cannot utilize this nitrogen directly either for powder or for fertilizer. Through a special electrical process it can be and is being used. It is therefore of interest to review briefly the process by which atmospheric nitrogen is made available and the necessary plant equipment used in Norway, where this process is being worked out successfully on a large scale.

The accompanying illustrations show the hydroelectric equipment in some of the Norwegian power plants which supply energy for operating electric furnaces of the Birkeland-Eyde and Schoenherr type, for producing nitrates by the oxidation of atmospheric nitrogen. For the development of this nitrogen industry, the supply of water power has been recognized as being most important as this industry cannot exist unless it can procure cheap electric power. There is no country in the entire world that can boast of more favorable conditions in this respect than Norway, and the enormous rise of this industry must be attributed to a very large extent to Norway's great opportunities in this line. Norway has not only high and magnificent waterfalls, but she has large mountain lakes, permitting the construction of enormous natural reservoirs for conveying the water to the power stations. The nitrate works are all situated in the southeastern part of Norway, in the Telemark River district.

Among the most important nitrate works are the Notodden factories situated on the Lake of Hiterdal, about 50 feet above sea level. A short channel with a series of locks permits communication with the town of Skien, an important seaport at the head of the Fjord. It is said at present vessels of 200 tons can ascend to Notodden and it is planned to enlarge the locks so as to allow the passage of seagoing vessels of 2000 tons. The ability to ship directly to all parts

of the world by water with but one transshipment is an important factor in the future of the manufacturing of Notodden nitrate.

The Notodden factories secure their power from two waterfalls, at Lienfos and Svaelgfos. They use about 60,000 horsepower. At Lienfos, about two miles from Notodden, there is a dam with a fall of about 55 feet, the volume of water available being 75 cubic meters per second. The power station is equipped with four units, of 5000 horsepower each, or a total of 20,000 horsepower.

There is also the larger Svaelgfos power house situated above and about one mile from Lienfos, where the volume of water is the same as at Lienfos. The dam has, however, a fall of about 165 feet. A tunnel takes the water to the reservoir from which four flumes cut into the solid rock, conduct the water to the station, where there are four sets of turbine generators nominally rated at 10,000 horsepower each, but capable of producing 13,000 horsepower. The three-phase 50-cycle power from these two waterfalls is transmitted at 10,000 volts to Notodden by six separate transmission lines, each line consisting of six cables, 12 millimeters in diameter.

There is a second power station at Svaelgfos. By an additional regulation of distant lakes in the same watershed, the volume of water is increased to 90,000,000 cubic meters for this new power station, which has two units of 10,000 horsepower each. About 16 miles further up the river the first regulating dam was built at Lake Tinn. The immense basin created by this dam makes it possible to store up fully 300,000,000 cubic meters of water. For transportation purposes to and from the Rjukan factories, it was necessary to build two railways, one of 19 miles, from Notodden up to the lower end of the Lake of Tinn, and one of 10 miles from the lake up to the factories at Saaheim. Ferryboats and large barges are used for transportation on the lake between the terminals of the railways.

The electric power transmission line was built on

Interior View of the Vemork Power Station. Installation of 140,000 Horsepower Supplying Power to the Rjukan Nitrate Factories.

heavy iron towers. About two and one-half miles from the factory up in the valley lies the power station, a large building of granite, about 120 meters long. The Rjukan waterfall lies one mile further up in the valley. It is not only this waterfall itself, but the total fall in the river of a distance of about six miles which is to be harnessed up.

Two power stations are provided for, one at Vemork, on a ledge of the cliff, 1000 feet below the terminal reservoir of the tunnel. The water is conducted from the reservoir down the mountain side to the turbines in ten huge flumes, side by side. These flumes are 5 feet in diameter. The upper sections are of riveted steel plates, the lower, where the pressure reaches 30 atmospheres, are made of welded plate, 1 inch in thickness. They rest upon a foundation built upon the granite of the mountain.

The water descends 971 feet to the Vemork turbines and upon leaving the power station the water enters another tunnel, excavated in the side of the cliff and is conveyed to a point slightly more than three miles down the valley where a similar series of flumes for the second plant is under construction. The total fall here is 909 feet. These two stations will furnish the factories with 250,000 to 270,000 horsepower when complete.

There are in the Vemork power house ten units, each of 14,000 horsepower. Pelton wheels, with a maximum capacity of 17,500 horsepower, are used for the turbines on account of the great pressure of the water. Three-phase 50-cycle current is transmitted from this power house to the nitrate works through 60 cables, partly of copper, but chiefly of aluminum. The working voltage is 10,000.

There is a reservoir at the top of the flumes blasted out of solid rock from the intake, where a dam is built across the river. For the regulation of the water supply, a dam has been built at Lake Mosvand by means of which the level of the lake is raised over 46 feet. As the surface of the lake is not less than 23 square miles, nearly 900,000,000 cubic meters can be retained. It is said that the minimum flow in the river is in this way increased from 5 to 47 meters per second, or the water power at Rjukan from 30,000 to 250,000 horsepower.

The Process for Fixation of Atmospheric Nitrogen.

It is well known that the atmosphere is composed of nitrogen and oxygen and Dr. Samuel Eyde has pointed out that more than 100 years ago Priestley and Cavendish observed that the oxidation of atmospheric nitrogen took place slowly under the action of electric discharges. Among others working in the production of nitrates by oxidation of atmospheric nitrogen have been Sir William Crookes, Lord Rayleigh and Sir William Ramsey in England, as well as Lovejoy and Bradley in America.

In explaining the Birkeland-Eyde process, Dr. Eyde states that it is necessary first to describe the electric flames consisting of powerful arcs which are used in the electric furnaces. The flame occurs from the formation of an arc between the points of the electrodes, which are close to each other in a highly magnetic field. The electric arc that has been formed moves on account of this powerful magnetic field with great velocity perpendicularly to the lines of force, so that the arc is lengthened and finally broken. As the length of the arc increases the resistance becomes greater and the tension increases, until it becomes so great that a new arc starts from the points of the electrodes. In order to regulate the current an inductive resistance is used in series with the arc. With alternating current all the arcs are formed in opposite directions and appear to the eye to be circular disks. This flame provides a very effective means for the oxidation of the nitrogen of the air. The flame in the furnaces burns with a steadiness that is really astonishing.

The electrodes are thick copper tubing, through which water passes for cooling purposes. The furnace chamber in which the flame burns is circular, of only a few centimeters in width, and about three meters in vertical diameter. The furnaces are lined with fireclay brick, through opening in which the air is admitted to the flame. The nitrous gases formed in the flame escape through a channel made along the casing of the furnace, which like the flame chamber is lined with firebrick.

Each furnace is furnished with an induction coil, by means of which the power is regulated as required. The induction coil serves, moreover, to keep the flame in the furnace steady and even while working. It is claimed that with this furnace there was obtained such steady working that it burns for weeks without any regulation worth mentioning. The maintenance of the furnace and its repair are simple, as the most exposed portions, the electrodes, need be changed every third or fourth week, and then only a small part of them. The firebrick masonry is changed every fourth to sixth month.

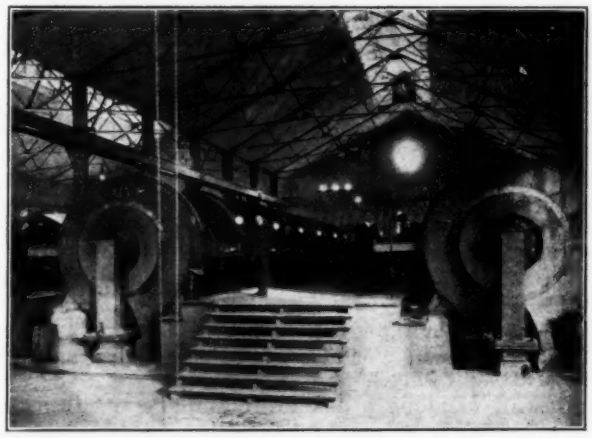
The temperature in the flames exceeds 3000 degrees centigrade. The temperature of the escaping gases may vary between 800 and 1000 degrees. The furnaces are made of cast steel and iron, the middle of the furnace being in the form of a circular flame chamber. The electrodes are led radially into this flame chamber. By aid of centrifugal fans the air is brought into each furnace through pipes from the basement. Furnaces have been built consuming energy from a few horsepower up to 5000 horsepower.

Later, Dr. Schoenherr, with an electrical engineer named Hessberger, of the Badische Company, perfected an electric furnace for the oxidation of atmospheric nitrogen constructed on quite different principles. In place of the great disk of electric flame he developed a long slender arc in the axis of a narrow iron tube through which a current of air is forced. The Schoenherr furnace as now used consists of a slender vertical column of iron plates 7 meters in height. The inner tube is the reaction chamber, the others form channels for the entrance of the air current and its exit after coming in contact with the flame. In this way the heat of the outgoing gas is transferred to the ingoing current.

At the lower end is the main electrode which is movable in a vertical direction, as it must be raised from time to time when the end is worn away by the arc. The reaction tube serves as the second electrode. By means of a lever the space between the electrode and tube can be bridged over and the arc formed. The air current, forced by a powerful aspirator, enters the lower part of the furnace and passes through the various channels. The entry into the reaction chamber is through a number of small tangential openings arranged in several horizontal rows in the sides. The current passes in this way around the chamber and the arc is driven up in the midst of the rapidly moving current of air. As a rapid cooling is of importance in securing a good yield, the upper third of the tube has a water jacket through which the gases pass, and in this way the reverse reaction is prevented to a notable degree. It is claimed that the reaction is identical with that obtained in the Birkeland-Eyde furnace, and the yield is practically the same amount of nitrate per horsepower used. In these electric furnaces the air is procured by swiftly revolving ventilators and is conducted through large iron pipe lines to the furnaces. There are at Notodden not only furnaces of the Birkeland-Eyde system of 3000 kilowatts, but also furnaces of the Schoenherr system, all of 1000 kilowatts.

Cooling and Absorbing the Nitrogen Gases Formed.

As soon as the air in the flame chamber has been acted upon by the electric flame, the nitrous gases



Interior View of Furnace House at Notodden.

formed pass out through pipes, which convey the gas to the steam boilers, in which the temperature, which was 1000 degrees centigrade, is reduced. The steam produced in the boilers is utilized in the further treatment of the products. In the boiler house there are also air compressors, which supply compressed air for pumping acid and lye in the various chemical departments. The gases pass on from the steam boilers through an iron pipe into the cooling house, and complete the cooling begun in the steam boilers. Each cooler consists of a great number of aluminum tubes, over which cold water runs, while the hot gases pass through them. The temperature of the gas is thus considerably reduced. From the cooling chambers the gases pass to the oxidation tanks.

These tanks are vertical iron cylinders, lined with acidproof stone. The object is to give the cooled gases a sufficient period of repose, in which time the oxidation of the nitrogen oxide may occur. The necessary amount of oxygen is present in ample quantity in the air which accompanies the gases from the furnaces.

From the oxidation tanks the gases are forced by blast engines into the absorption towers. Broken quartz, which is affected neither by nitric gases nor by nitric acid, is used in the towers. To assist the passage of the gases on their way from the furnaces there are centrifugal aluminum fans on each row of towers. The gases enter at the base of the first tower, go up through the quartz packing and thence by a large earthenware pipe enter the top of another tower, and so on, until the air, relieved of all nitrous gases, leaves the last tower.

Water trickles through the granite towers and by absorbing the nitric oxides is gradually converted into a weak acid. The absorbing liquid enters the top of the tower and is distributed in jets by a series of earthenware pipes, so that the permeating gases enter into intimate contact with the liquid. Nitric acid is thus formed in the granite towers. In the iron towers a weak solution of caustic soda is used which on absorption of the gas is converted into a solution of nitrate of soda.

Conserving Labor at Freight Terminals

Electrical Methods of Handling Package Goods and Less-Than-Carload Lots Will Receive New Impetus Owing to Present Traffic Congestion

By H. W. YOUNG

AT THE time the war broke out, the annual requirements of every man, woman and child in this country demanded the transportation of 15 tons of freight over a distance of 250 miles. Since the beginning of the war, things have moved so fast that there has been no opportunity for the statistician, even, to catch up. What the movement of freight per capita now is probably no one has figured out. At any rate, it has been enormously increased.

Package goods and less-than-carload lots, at the time the above figures were secured, amounted approximately to 40 per cent of the total. It is this class of freight handling at railway and steamship terminals that consumes much time and costs money. The expense of handling a box in New York and Chicago terminals is more than that of carrying the box the thousand miles which intervene.

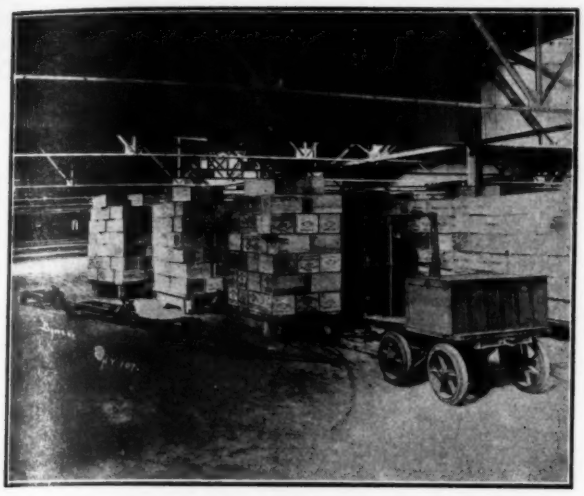
And it is not the labor involved, alone, which is the serious question. Although there are two and a quarter millions of freight cars on our railroads, every one knows how inadequate the supply is at the present time. Every hour that a car is unnecessarily tied up at the terminal during the unloading process means millions of car-hours in the aggregate. Cars are precious commodities.

Efficiency at Terminals.

The immediate way to facilitate the handling of freight is to make the terminals as efficient as possible. Measured by results obtained, the introduction of modern, electrically operated devices will cost less per car-hour gained than any other measure which could be employed. The lowering of grades, straightening out of curves and improving road beds is too slow to obtain the immediate benefits which are required.

In the past, the Electrical Review has described and illustrated many forms of tractors, motors, telpherage systems, etc., which have been successfully operated in terminals, docks and warehouses. There is nothing particularly new about these systems. It is nevertheless true that at this time of greatest need there are terminals upon terminals where the hand

Electric Tractor Used by American Express Company at Indianapolis.



Unique Type of Tractor Which Saves $71 Per Day in Labor.

operated truck, the longshoreman and the roustabout perform manually the tasks which should have long ago been relegated to modern machinery. The accompanying illustrations are presented as reminders of the good and efficient equipment which will reclaim car-hours and release men who are urgently needed elsewhere.

Examples of Labor-Saving Methods.

Just as an example of the point in question, take the Harrisburg transfer of the Pennsylvania Railroad. During the daytime two tractors were employed hauling trucks, with 11 gangs of men helping indiscriminately. The average tonnage per trucker was in this case 20.5 tons per day.

Full tractor operation was employed at night. Four tractors did the work with the assistance of five gangs of men, and one man less per gang. In this case the average per trucker was 24.7 tons per day.

At another point this same railroad formerly employed 132 truckers. Then tractors with trailers were installed and 73 men are now handling 500 tons a month more freight than the 132 previously handled.

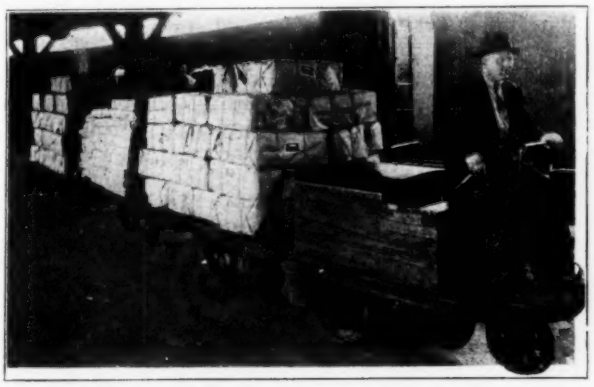
Among the devices which come readily to mind for accomplishing the above purpose are: Hoists for handling bulky loads at piers and in warehouses; tractors, storage-battery type, for hauling specially designed trailers or the ordinary two and four-wheeled platform trucks; motor-operated inclined elevators for facilitating movement of hand trucks from floor to floor or to car loading platforms; tiering machines for handling barrels, boxes, etc., rapidly in warehouses and also increasing the capacity of the storerooms, thus relieving congestion; telpherage systems for overhead handling of package goods and getting them away rapidly form platform storage; moving platforms and elevators.

Electrically Operated Inclined Truck Elevator at Detroit.

A Central-Station Opportunity.

In the case of the various forms of tractors, of course their operation inside of stations and freight houses precludes the use of any form of power other than storage battery, and as a consequence they offer an attractive off-peak load for the central station. All of the other forms of equipment are also motor-operated and much of the work performed by them would be night work, also an off-peak proposition.

There are probably 100 manufacturers who are turning out machinery and devices useful in the intensive cultivation of the terminals. This does not take into account the manufacturers of batteries, motors and other accessories to these machines. This is a time when co-operative work on the part of the manufacturer of such equipment, the manufacturer of motors, batteries and control devices and the central station, which furnishes the power for their operation, could be made very profitable. At the same time, such co-operation would lend materially to achieving the end to which our government is now bending its efforts.



Electric Tractor Working at a Railway Terminal.

Minneapolis Company Secures 1000-Horsepower Contract.

The Minneapolis General Electric Company has closed a contract with the Pillsbury Flour Mills for 1000 horsepower in motors covering the electric energy requirements of their new mill. Other new business contracted for includes 373 customers with 195 kilowatts of lighting and 111 horsepower in motors, of which 66 horsepower covers the additional requirements of the Martoccio Macaroni Company. Thirty-two house-wiring contracts were closed. New business connected to the company's lines during last week includes 46 customers with 65 kilowatts of lighting and 853 horsepower in motors. Electric energy output shows an increase of 20.3 per cent over the corresponding week last year.

The company established a new maximum daily output on November 8, when 827,240 kilowatt-hours were generated as compared with 793,310 kilowatt-hours, the highest previous record.

Uses of Magnetic Separator Pulleys

Magnetic Separation Employed in Many Industries—Typical Examples in Sugar Refining and Pulverizing Coal—Construction and Operation of Magnetic Separator Pulleys

THE use of magnetic separator pulleys has increased to such an extent during the past few years that one manufacturer claims to have this class of pulley in operation in no less than 35 different industries. They have been found useful wherever it is desired to remove continuously the magnetic content from non-magnetic bulk material.

Among the many uses for such pulleys may be cited are the following: They are used with success in removing pick heads, coupling pins, etc., from coal passing to a crusher which would be seriously damaged by the entrance of such material. They are used for similar purposes at phosphate-rock mines and quarries. In the production of sulphite fiber paper stock, they are used to remove tramp iron and steel from the wood chips before these are delivered to the sulphite tanks. They are also used for this purpose in the production of cement, gypsum, limestone, clay for terra cotta manufacture, as well as in the freeing of grain, spices and tobacco from bits of iron or steel before grinding. They also find employment in city refuse-disposal plants, for removing tin cans, horse shoes, nails, etc., from the worthless material. The high cost of metals has also made the saving of metal turnings and separation of iron and steel from brass well worth while.

Use of Magnetic Separator Pulleys in Refining Sugar.

An example of an interesting application is found in the sugar industry, an industry in which it would seem there would be no need for such equipment. Magnetic separators are in use in a large number of sugar plants, a report on the use in one, the Revere Sugar Refining Company plant, giving an idea of the work done in this industry.

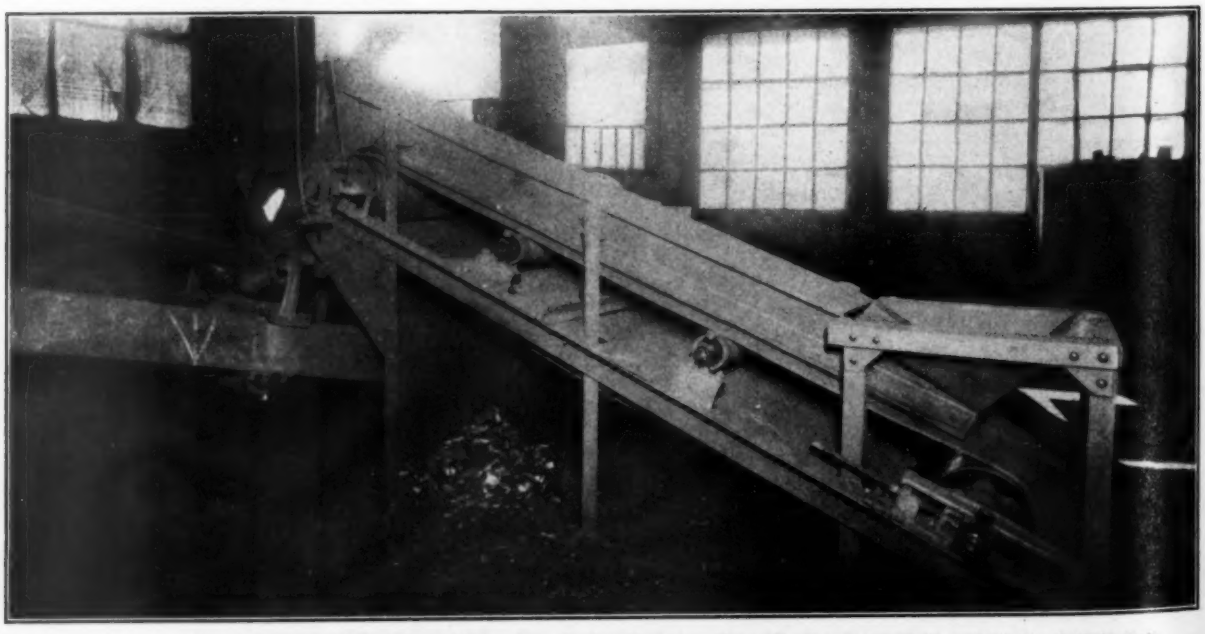
The separator in this plant is installed to remove iron rust or iron oxide from animal charcoal which is collected by it while passing through the ovens and being baked. This baking process is necessary to eliminate from the charcoal the impurities which it has absorbed from the sugar. The magnetic material is especially prevalent after the retort has been repaired. Under ordinary conditions the magnetic pulley is energized only part of the time, two weeks out of a month or so, this being sufficient to keep the iron oxide out of the bone charcoal so that trouble with iron coloring in the sugar is prevented.

The magnetic pulley in this installation is placed in the delivery end of the conveyor which carries the animal charcoal from the retorts to the elevator. The material from which the iron content is to be removed is carried about 1 inch deep on the belt, the separator pulley revolving at about 50 revolutions per minute and handling 5000 cubic feet of charcoal in 24 hours.

Separators for Pulverized-Coal Plants.

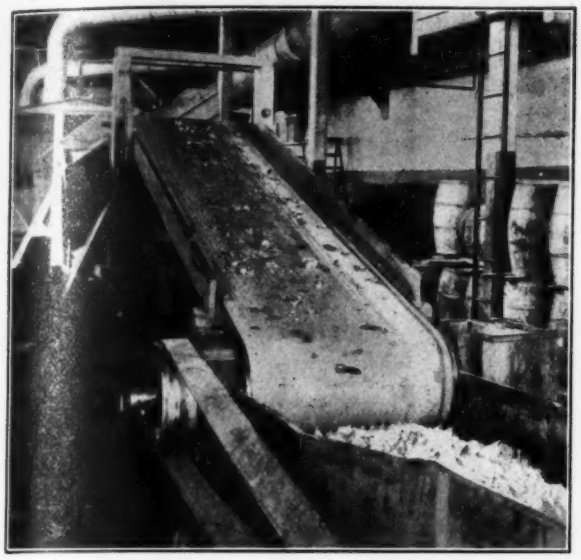
The use of pulverized fuel has been extended and this has led to the need of magnetic separators in cement plants, steel plants, power houses and many other kinds of plants. For open-hearth furnaces, a brief mention follows of the process of furnishing the pulverized coal and the use of the magnetic separator for freeing it of iron.

First the tramp iron is removed from the coal by means of magnetic separators. Coal as delivered to the milling plant always contains an astonishing amount of tramp iron in the form of bolts, nuts, rivets, nails, bar iron, railroad spikes, mule shoes, etc. Any of these materials entering the crusher of the pulverizer might result in damage to the machine, with consequent delays in operation.



Separating Iron From Brass in Allyne Brass Foundry. Cutler-Hammer Magnetic Separator Pulley at Head of Main Belt.

The foreign material can be entirely eliminated by the use of a magnetic separator located at some point ahead of the crusher. When the material passes over the pulley which contains the magnet, the magnetic material, consisting of the tramp iron, is attracted and



Removing Iron Buttons, Buckles, Etc., From About 100,000 Pounds of Rags Daily in Plant of Diamond Steel Fibre Company. Two 12 by 24-Inch C-H Magnetic Separator Pulleys Operate in Series. Rags Pass Under the Pulley.

held firmly against the belt and remains in contact with the belt until it leaves the magnetized zone, which is at some point beyond the under side of the magnetic pulley. The tramp iron drops from the belt after it leaves the pulley and is delivered to suitable boxes by means of a chute, the coal continuing on its course. A considerable amount of scrap iron is collected in a large plant in this manner.

The shortage of natural gas caused the Missouri, Kansas & Texas Railroad to decide upon pulverized fuel for the water-tube boilers in the power house of its shops at Parsons, Kans. The equipment for pulverizing and drying fuel is contained in a separate building, which is located near one end of the boiler house. The coal is dumped from the cars directly into a concrete track hopper adjoining this building. The plant is designed to handle either mine-run or slack coal and immediately below the track hopper is placed a set of rolls, which reduce lumps up to 12 by 18 inches to 5-inch cubes or less in one operation.

As the coal passes through this crusher, it drops onto a belt conveyor, which discharges directly into a set of corrugated rolls. The upper end of the belt conveyor passes over a 24-inch by 22-inch Cutler-Hammer magnetic separator pulley, the function of which is to remove any pieces of iron or steel which may be in the coal and retain them on the belt until the latter passes off the underside of the pulley, the metal then dropping to the floor behind the crusher. This crusher reduces the coal to pass through a three-fourths-inch mesh or less and delivers it into a dust-tight elevator, from which it is distributed into a storage bin over the coal drier.

Furnishing powdered coal as a locomotive fuel by the Santa Fe Railroad made necessary a crushing plant and magnetic separator at Marceline, Mo. Here the coal (mine screenings) is fed through a drier, at the discharge end of which there is located a separator which takes out any tramp iron that may be in the coal.

Construction and Operation of Magnetic Separator Pulleys.

Summarizing in a few words, it may be said that magnetic separator pulleys may be used for the separation of tramp iron and magnetic content from bulk materials, and for the protection of grinding, crushing and pulverizing machinery. They are not suited to all classes of ore separation, though they are used very successfully on some.

The magnetizing of the pulley is accomplished by means of passing direct current through windings in the interior of the pulley. The current sets up a magnetic flux which passes through the belt and attracts any iron or steel that may be contained in the material carried by the belt. As a result these pieces are held in contact with the belt until the latter leaves the pulley underneath. Here they are dropped and may be collected in a box or kept separate (by means of a barrier) from the other material which is projected beyond the pulley. The disposal of the materials may be cared for according to the amount and kind of product handled.

Direct current is required to energize the magnetic separator pulley when in operation. Only a small amount of current is required, the average for sizes in greatest use being but a few amperes. Standard pulleys can be connected, therefore, to any 110 or 220-volt direct-current electric system, although pulleys may also be made for use on 500-volt direct-current circuits. If only alternating current is available, some form of rectifier, such as a rotary converter, motor-generator or mercury-arc rectifier, must be used to furnish direct current.

These separating pulleys can often be used to replace the existing head sheave where a belt conveyor is being used. The small-diameter pulley is unsuitable for driving long or steep conveyor flights. In many cases, it will be found cheaper to install a short conveyor, say about 6 feet long, onto which the main conveyor discharges. The magnetic separator pulley can then be used on the discharge end of this short

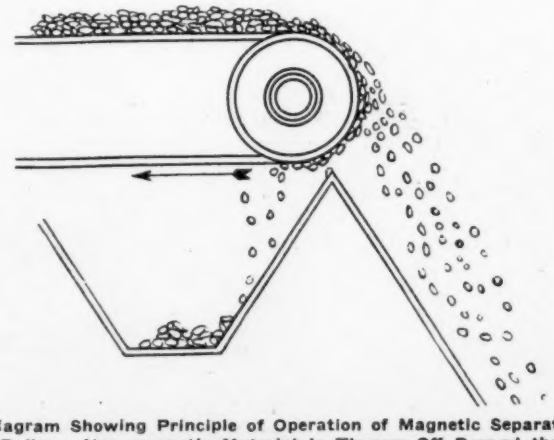


Diagram Showing Principle of Operation of Magnetic Separator Pulley. Non-magnetic Material Is Thrown Off Beyond the Pulley, While Magnetic Material Remains on the Belt Until Latter Leaves the Pulley.

conveyor. A similar arrangement can also be used where the material to be separated is being discharged from a chute. Sometimes a portable separator-pulley outfit mounted on a truck is useful.

The Magnetic Circuit—II

Distinction Between Electric and Magnetic Circuits—Reluctance and Permeance and Their Relations and Laws

By TERRELL CROFT

This is the second section of an article that will appear in five parts. It gives for the non-technical reader who is familiar with the elementary principles of electric circuits a simple explanation of the phenomena and laws of magnetic circuits, which are so extensively employed in the electrical industry. Like the first section, this one is quite elementary because it is necessary to have a thorough grasp of the fundamental magnetic facts. The remaining sections will complete the discussion of magnetic laws, particularly as they relate to iron, and give a good introduction to the design and calculation of simple magnetic circuits.

THE distinction between the electrical circuit and the magnetic circuit should not be disregarded. This paragraph is inserted here to caution the reader that while analogous and computed by the same general process, the magnetic and electric phenomena are entirely distinct and separate conditions. Hence, it must not be inferred from the preceding section of this article that an electric current is the same thing as a flux of lines of force. In fact, they are entirely different things, except that the flow of an electric current is governed by laws similar to those which govern the development of magnetic flux. It is true that electric currents and magnetic fluxes are closely related. Electricity moving in the conductor of an electric circuit, can, as has been shown, produce a magnetic flux. Conversely, if the flux of a magnetic circuit cuts a conductor of a closed circuit, a current of electricity will be produced in that electric circuit.

The "Ohm's Law" of the magnetic circuit is the term which is sometimes applied to the fundamental law of the magnetic circuit, which will now be recited. The same underlying natural principles which govern the phenomena in electric circuits also govern the phenomena in magnetic circuits and, for that matter, in all circuits whatsoever. For all circuits—electric, magnetic, hydraulic, pneumatic, caloric, and what not—the same general law holds. That is, it is always true that *the result produced is directly proportional to the effort and inversely proportional to the opposition.* It can be shown that, for any electric circuit, the so-called Ohm's law applies. That is:

$$\text{current} = \frac{\text{electromotive force}}{\text{resistance}} \qquad (4)$$

It can be demonstrated experimentally and, in fact, it follows from the nature of things, that for a magnetic circuit a similar law holds; that is:

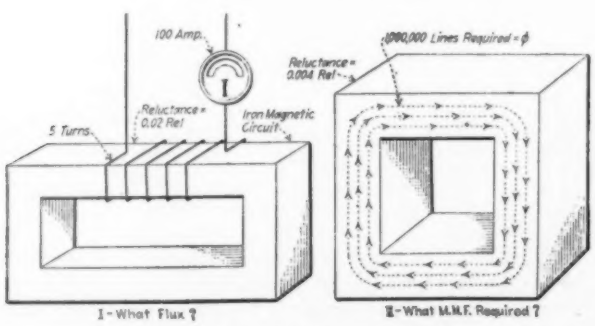


Fig. 9.—Magnetic Circuit Problems.

$$\text{flux} = \frac{\text{magnetomotive force}}{\text{reluctance}} \qquad (5)$$

The similarity between the electric circuit, equation (4), and the magnetic circuit, equation (5), is obvious. The essential concepts of the magnetic circuit can, as will be shown, readily be developed in much the same way as the electric-circuit ideas are developed from the simple fundamental Ohm's law. Using symbols instead of words, formula (5) becomes:

$$\phi = M/R^1 \qquad \text{(lines)} \qquad (6)$$

$$M = R^1 \times \phi \qquad \text{(ampere-turns)} \qquad (7)$$

$$R^1 = M/\phi \qquad \text{(rels)} \qquad (8)$$

wherein, ϕ = the flux in the magnetic circuit, or any portion of the magnetic circuit, under consideration, in lines of force or maxwells; M = magnetomotive

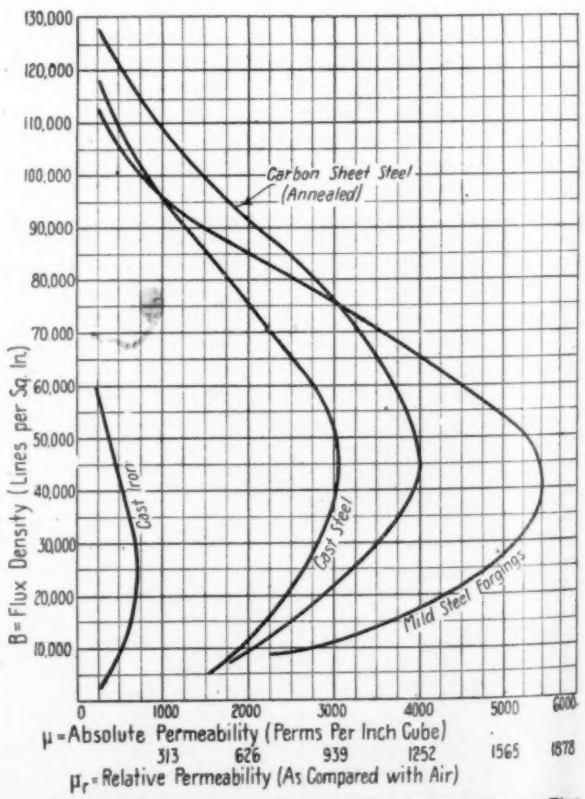


Fig. 10.—Graphs Showing Relation of Permeability to Flux Density in Certain Irons and Steels.

force, in ampere-turns, to which ϕ is due; R^1 = reluctance, in rels, of the magnetic circuit or the portion of the magnetic circuit under consideration.

Examples of Calculations Under Law of Magnetic Circuit.

If in Fig. 9, I, the magnetomotive force in a certain magnetic circuit is 500 ampere-turns and the reluctance of the circuit is 0.02 rel, what flux would be developed in this circuit? Solution.—Substitute in equation (6): $\phi = M \div R^1 = 500 \div 0.02 = 25{,}000$ lines.

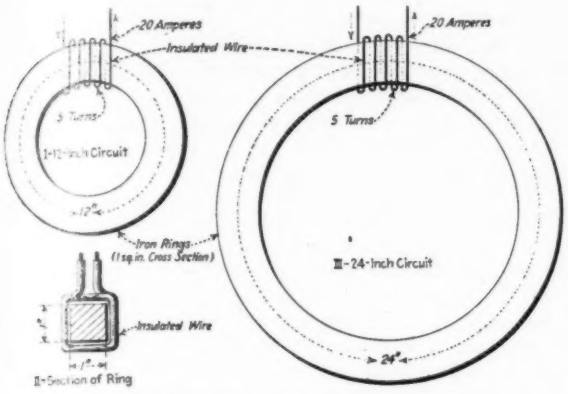


Fig. 11.—Examples of Magnetic Circuits.

If in Fig. 9, II, a flux of 1,000,000 lines is required in a magnetic circuit which has a reluctance of 0.004 rel, what magnetomotive force would be necessary to develop this flux? Solution.—Substitute in equation (7): $M = R^1 \times \phi = 1{,}000{,}000 \times 0.004 = 4000$ ampere-turns.

In a certain air-core magnetic circuit a magnetomotive force of 45,000 ampere-turns develops a flux of 2500 lines. What is the reluctance of this circuit? Solution.—Substitute in equation (8): $R^1 = M \div \phi = 45{,}000 \div 2500 = 18$ rels.

Reluctivity and Reluctance.

Reluctivity (symbol is ν, pronounced nu) is specific reluctance. This property is similar to resistivity, which is specific resistance. Reluctivity in practical work is measured in rels per inch cube.

The reluctivities of different substances must obviously vary, since the reluctances of different substances vary. However, the reluctivity of all non-magnetic substances is the same, namely 0.313 rel per inch cube. The reluctivities of magnetic substances vary with the flux density, the greater the flux density the greater the reluctivity within certain limits. The reluctivity of mild steel or wrought iron is, under the most unfavorable conditions, about 0.00018 rel per inch cube. The reluctivity for cast iron, under the most unfavorable conditions, is about 0.00164 rel per inch cube. Just how reluctivity varies with flux density can be appreciated from a consideration of the permeability (permeability is the reciprocal of reluctivity) values given in Fig. 10 and Table *I*.

The computation of reluctance, using the quantity reluctivity involves the same general process as that whereby the resistance of any conductor may be figured on the basis of the resistivity of the material of that conductor. The following formulas are based on these truths: The reluctance of any magnetic path is *(a) increased as the length of the magnetic path is increased, (b) increased as the cross-sectional area of the magnetic path is decreased, and (c) increased as the reluctivity of the material comprising the path is increased.* That is, the reluctance is directly proportional to the average length of the lines of force, is inversely proportional to the cross-section of the path, and varies with the material of the path.

For example, consider the two simple magnetic circuits (*I* and *III*) of Fig. 11, the rings of both of which have the same cross-sectional area and are composed of the same kind of iron. The magnetomotive force in each case is 20 ampere-turns. Now, if this 20 ampere-turns magnetomotive force produced a total flux of 5300 lines in the iron ring of *I*, which is a magnetic circuit of a mean length of 12 inches, the flux in the ring of *III*, which is twice as long (24 inches) would be only about one-half of 5300 lines, or 2650 lines. It would be exactly one-half of 5300 lines were there not certain corrections (magnetic leakage) which must be made, and were it not for the fact that reluctivity may vary with the flux density. It is apparent that if the length of the circuit, that is, the opposition to magnetization, is doubled, the flux would be one-half. Similarly, if an iron core of larger area were substituted for that of *I*, the ampere-turns being maintained the same, the opposition or reluctance offered by the core would be correspondingly decreased, hence the total flux would be correspondingly increased. Furthermore, if the magnetomotive force of either *I* or *III* were doubled in each case, that is, increased to 40 from 20, the flux would be doubled. Corrections for leakage must be made in order to ascertain the actual flux with great accuracy, but in many cases such corrections can be disregarded, and in any event, they do not materially affect the general truth of the above statement.

The formulas for figuring reluctance of a path on the basis of reluctivity, length and area of the path are these (obviously, they follow from the facts outlined in the preceding paragraph and example):

(9)	$R^1 = \nu \times l/A$	(rels)
(10)	$\nu = A \times R^1/l$	(rels per inch cube)
(11)	$l = A \times R^1/\nu$	(inches)
(12)	$A = \nu \times l/R^1$	(square inches)

wherein, R^1 = reluctance, in rels, of the magnetic path or portion thereof under consideration; ν = reluctivity of the material of the path under the existing conditions, in rels per inch cube; l = length of the magnetic path or portion thereof, under consideration, in inches; A = area of the magnetic path under consideration, in square inches.

The application of these formulas is quite simple. For example, what is the reluctance (Fig. 12) of an air (or any other non-magnetic) core 2 square inches in cross section and 10 inches long. Solution.—The reluctivity of air or of any other non-magnetic material is always 0.313 rels per inch cube. Therefore, substituting in equation (9): $R^1 = (\nu \times l) \div A = (0.313 \times 10) \div 2 = 3.13 \div 2 = 1.57$ rels.

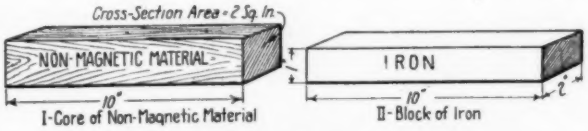


Fig. 12.—Example in Computing Reluctance.

Again, if the reluctivity of a certain specimen of iron is 0.001 rel per inch cube under given conditions, what is the reluctance of a piece of this material, Fig. 11, *II*, 1 inch × 2 inches in cross-section and 10 inches

long? Solution.—The cross-sectional area of the piece is 2 square inches. Substitute these values in equation (9): $R^1 = (\nu \times l) \div A = (0.001 \times 10) \div 2 = 0.01 \div 2 = 0.005$ rel.

The joint reluctance of a number of magnetic paths in parallel may be calculated by a method identical to that for figuring the joint resistance of a number of conductors in parallel. The joint reluctance of a number of such parallel paths is equal to the reciprocal of the sum of the reciprocals of the reluctances of the separate paths. That is, the joint reluctance is equal to the reciprocal of the sum of the permeances of the separate paths.

The joint reluctance of a number of magnetic paths in series is equal to the sum of the reluctances of the individual paths. Reluctances in series are thus added to obtain the total reluctance, just as resistances of a number of conductors in series are added to obtain the joint resistance of the series combination.

Permeance and Permeability.

Permeance (symbol is P) is that property of materials which is the opposite of reluctance. Reluctance implies the difficulty encountered in developing magnetic flux, whereas permeance implies the ease or readiness with which the flux may be developed. Permeance in magnetic circuits is analogous to conductance in an electric circuit. Permeance is numerically equal to the reciprocal of reluctance. That is: $P = 1 \div R^1$. In other words, permeance might be called the "magnetic conductance" of a material. The *perm*, which is analogous to the mho, has been suggested as the unit of permeance. Conductance values are useful in electric circuit computations when it is desired to determine the joint resistance of a number of conductors in parallel. In the same way, permeance values are convenient when it is desired to determine the joint permeance (or joint reluctance, which is the reciprocal of the joint permeance) of a number of magnetic paths which are in parallel.

Iron and steel are materials of high permeance. It is exceedingly fortunate that it has so happened that one of the commonest of metals, iron, is the one with the greatest permeance. If it were not for the fact that this relatively cheap metal were also very permeable, it is probable that the present electrical development would be impossible. If it had so happened that some expensive metal—gold, for instance—were required to provide paths of high permeance for magnetic circuits of our electrical machinery and devices, instead of the iron which is now used, electrical machinery would be very costly. Hence extensive electrical development would, because of the economics of the situation, be impossible.

The magnetic-circuit equations involving permeance instead of reluctance follow from those already given. The derivation of the three following formulas will be apparent if one remembers that permeance is the reciprocal of reluctance, that is, that $P = 1 \div R^1$.

(13) $\phi = P \times M$ (lines)

(14) $P = \phi/M$ (perms)

(15) $M = \phi/P$ (ampere-turns)

wherein, the symbols have the same meanings given hereinbefore except that P = permeance, in perms per inch cube.

Permeability (symbol is μ, pronounced mu) is

Table I.—Magnetic Properties of Iron and Steel.

(See Fig. 9 for graphs illustrating these properties.)

B Flux Density (Lines per square inch)	H M. M. F. Gradient or Magnetic Intensity (Ampere-Turns per inch length)	μ Absolute Permeability (Perms per inch cube)	μ_r Relative Permeability (as compared with that of air)
Carbon Sheet Steel (Annealed)			
10,000	5.01	1996	625
20,000	7.20	2775	870
30,000	8.77	3416	1,071
40,000	10.3	3866	1,212
50,000	13.2	3796	1,190
60,000	16.6	3611	1,132
65,000	19.	3420	.....
70,000	21.3	3283	1,029
80,000	29.4	2715	851
90,000	43.2	2080	652
100,000	67.0	1490	467
110,000	117.	937.9	294
120,000	227.	526.4	165
125,000	365.	370.0	116
Mild Steel Forgings (Wrought Iron)			
10,000	3.76	2657	833
20,000	4.70	4252	1,333
30,000	5.64	5091	1,596
40,000	7.20	5547	1,739
50,000	9.40	5318	1,667
60,000	13.9	4351	1,364
65,000	16.0	4070	1,275
70,000	20.4	3436	1,077
80,000	32.6	2453	769
90,000	62.6	1436	450
100,000	134.7	743.2	233
105,000	197.2	532.7	167
110,000	324.2	338.1	106

B Flux Density (Lines per square inch)	H M. M. F. Gradient or Magnetic Intensity (Ampere-turns per inch length)	μ Absolute Permeability (Perms per inch cube)	μ_r Relative Permeability (as compared with that of air)
Cast Steel			
10,000	5.64	1774	556
20,000	8.77	2278	714
30,000	10.9	2791	875
40,000	13.4	2967	930
50,000	16.9	2954	926
60,000	22.5	2657	833
65,000	26.0	2500	797
70,000	31.0	2255	707
80,000	45.7	1745	547
90,000	70.5	1276	400
100,000	117.4	851.7	267
110,000	228.6	481.7	151
115,000	317.9	360.5	113
Cast Iron			
10,000	20.0	497.6	156
20,000	32.9	609.3	191
30,000	51.4	583.4	183
40,000	82.1	488.1	153
50,000	134.	370.0	116
60,000	224.	266.7	83.6
65,000	322.	201.3	63.1

specific permeance. It is measured in perms per inch cube. (Do not confuse absolute permeability with relative permeability, which is treated below.) Permeability is analogous to conductivity. In other words, permeability is the permeance of a one-inch cube. From what precedes it follows that, numerically, permeability is the reciprocal of reluctivity, that is, $\mu = 1 \div \nu$ or $\nu = 1 \div \mu$.

The absolute permeability of different substances varies in the case of magnetic materials with the flux

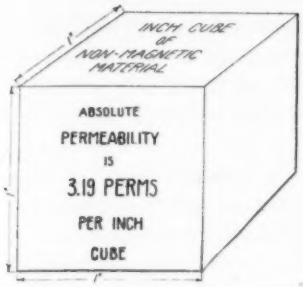


Fig. 13.—Absolute Permeability of Air or Other Non-magnetic Materials.

density, as is obvious from a consideration of the fact that reluctivity of magnetic substances varies with the flux density. The absolute permeability of air and of other non-magnetic materials is 3.19 perms per inch cube, Fig. 13. Table I shows how the absolute and relative permeabilities of magnetic materials vary with flux density.

The distinction between absolute permeability and relative permeability should be noted. In many textbooks on electromagnetism the permeability of air is given as 1. This value of 1 is, however, the relative permeability and not the absolute permeability. Absolute permeability, like absolute conductivity, depends upon the unit selected and, with the *ampere-turn*, the *flux-line* and the inch as units, the absolute permeability of air comes out as equal to 3.19 perms per inch cube. However, it is also perfectly legitimate to express the permeability of iron in terms of that of air, in which case the relative permeability of air becomes unity, or 1. An analogous situation is this: The conductivity of aluminum may be expressed either in ohms per inch cube or its relative conductivity may be referred to that of copper, which is then taken as unity. An absolute permeability value is always larger than the corresponding relative permeability value. Thus, where an absolute permeability value in perms per inch cube is given, this value will be 3.19 times greater than the corresponding relative (as compared with air) permeability value.

It should therefore be noted that to reduce an absolute permeability value, expressed in perms per inch cube, to a relative (as compared with air) permeability value, divide the relative permeability value by 3.19 or multiply it by 0.313. To reduce relative permeability to absolute permeability in perms per inch cube, divide by 0.313, or multiply by 3.19.

To compute permeance by utilizing permeability values, the following formulas may be used:

(16) $P = \mu \times A/l$ (perms)

(17) $\mu = l \times P/A$ (perms per inch cube)

(18) $l = \mu \times A/P$ (inches)

(19) $A = l \times P/\mu$ (square inches)

wherein all of the symbols have the same meanings as given before, except that μ = permeability, in perms per inch cube.

(To be continued.)

BYLLESBY UTILITIES MEET WAR CONDITIONS.

Financing for Needed Extensions Principally Through Sales of Stock to Customers.

By Otto E. Osthoff,

Vice-President and Chief Engineer, H. M. Byllesby & Company.

At most properties extraordinary demands for power service, and at certain properties the requirements of army training camps, necessitate additional investment. Additions and extensions now in hand and planned for the next fourteen months will be financed partly by the sale of the individual companies' securities in their local territories. Our plan of local security selling has met with a gratifying measure of success. Northern States Power Company, Western States Gas & Electric Company, San Diego Consolidated Gas & Electric Company, Ottumwa Railway & Light Company, Oklahoma Gas & Electric Company and Arkansas Valley Railway, Light & Power Company, all have large and growing lists of home stock and bond holders.

Public utilities are vital to industrial and social welfare as well as to war production. Our power companies are helping to build ships, extract ingredients for explosives from kelp, operate flour mills, mine ore, run munition and agricultural implement factories, and assisting hundreds of establishments to increase the output of necessary articles. Every industrial plant connected to our lines is saving fuel compared with the consumption of isolated power plants. Besides this, 45 per cent of all power supplied by Byllesby companies is generated by water power. The bulk of the gas furnished by our properties is natural gas. We have three army training camps supplied by our properties—at Louisville, San Diego and Tacoma.

Increased operating expenses at some utilities have brought about a condition whereby the utilities are entitled to higher rates for service. The public and utility commissions are recognizing the justice of increased compensation. We have found a spirit of fairness on the part of the public wherever these questions have been raised. One of our companies has obtained the consent of large power users to accept temporary advances in service rates, by simply presenting facts. Owing to the price of gas oil our San Diego Company has applied to the California Railroad Commission for advanced rates. The Tacoma Gas Company has filed a similar application with the Washington Utilities Commission, which recently permitted increased street railway fares in Seattle.

Louisville Gas & Electric Company is now mining its own coal and shipping it in its own steel cars, with a marked saving under current market prices, and the assurance of a plentiful supply. A new 15,000-kilowatt turbine recently placed in operation is expected to achieve still further economies. At Minneapolis a new 33,000-horsepower steam turbine is being installed which will still further increase both the efficiency and the capacity of this steam auxiliary station.

The problems now being worked out by public utilities are no more difficult than many which have been solved in the past and those met with in any business. Intrinsic values of securities based on these properties are at present as sound as they always have been.

Editorial Comment

Trade Acceptances

THE adoption of the trade acceptance by the Electrical Supply Jobbers' Association, in convention at Cincinnati last week, is a step in the right direction and one that should redound to the benefit of the entire electrical industry. As pointed out in our issue of October 13, the electrical interests can well emulate the practice of trade associations in other industries in speedily putting into effect this instrumentality of credit, which has so many advantages over the old open account—advantages both to the buyer and seller.

The action of the jobbers should be immediately followed by similar action on the part of the electrical contractors and manufacturers, as these branches have also suffered severely from the evils of lax credit methods. Particularly will the electrical contractor be benefited by the adoption of trade acceptances, as too often he is deficient in collection methods and hence is grossly imposed upon. There is no single factor that can do more to improve the credit rating of electrical contractors than the universal employment of trade acceptances, both by buyers and sellers. In fact, many jobbers and manufacturers would gladly honor a trade acceptance from a contractor's customer in payment for merchandise ordered by the contractor.

The contractor and dealer who settles by trade acceptances will place himself in a class of preferred buyers, the same as those who discount for cash as against those who, declining to use trade acceptances, insist upon a long open book account. Naturally those who demand long credit will pay higher prices than those who discount or use trade acceptances.

The trade acceptance offers tangible benefits to practically all branches of business and the conditions were never more favorable and propitious for their introduction than at present. It should be taken seriously and its merits considered, almost in a patriotic sense, as an aid to the Government's reserve bank system in keeping the working capital of the country liquid and available for all emergencies.

Co-Ordination of War Industries

COMMENTING on an editorial suggestion recently made in the ELECTRICAL REVIEW, one of the leading daily papers says:

There has been some talk of the creation of a board to be composed of men of vast experience in industrial and executive positions for the purpose of co-ordinating the various activities. So far as is known, this has not taken definite form, but the matter has been discussed and commented upon quite freely by business men engaged in various lines of war activity. An illustration of what would be prevented is found in the experience of a shipbuilding company which made one of the early contracts with the Government and immediately got busy in providing lumber with which to build ships. Before the lumber had reached its destination at the shipyards it was commandeered by the War Department for building cantonments, thus delaying the government contract for ships, as new lumber had to be contracted for, cut and delivered before the work on the ship contract could proceed.

It is becoming evident that there is need of greater co-ordination in various lines of endeavor now mobilized for the war period. Those who have visited Washington recently and have studied the tremendous undertaking of the Government in connection with the prosecution of the war, while impressed by the remarkable accomplishments at the capital during the last few months, carry away with them the impression that the principal need at this time is a greater co-ordination of the energies and efforts being put forth. Necessarily, in the mobilization of these energies in so short a period of time, it is impossible to co-ordinate them and prevent waste or working at counter purposes. It requires time to bring together in the various departments the ability and experience that has been mobilized by the Government and avoid any conflict of effort and waste.

The ELECTRICAL REVIEW is glad to see this matter taken up and discussed by other papers; and its own efforts, both through reading columns and personnel, will be devoted as largely as possible to the end sought.

Justice to Utility Securities

LEADERS among the bankers and bond houses are trying to work out some practicable plan for supervision of the issuance of securities, including those of public utility companies, during the period of the war. It is desired to provide a means by which necessary corporate and commercial financing can be cared for without interference with the Government's huge money-raising undertakings.

All business of this kind has been virtually suspended for the last six months, except for a few issues of short-term notes put out to cover refunding or other urgent needs. It is realized that under these conditions there is danger of utilities that are of important service to the Government in carrying on the war being crippled through lack of financial accommodations; that present haphazard methods necessitate the paying of excessive interest on what financing is done; and that, unless some regulatory action is

taken, the results may be unsettling and harmful to the general business situation at a time when it is highly desirable to avoid any such unfavorable developments.

The Secretary of the Treasury has given unstinted praise to the bond men for the patriotic, energetic and efficient part they took in bringing to unqualified success the war bond flotations; but these men, while willing to do all in their power, feel that it would be only just for the Government to do something toward lessening the financial burden that the war has brought upon them. Theirs is a business, like that of technical publishers, which is working for the Government without compensation.

The flotation of government bond issues in the billions not only destroys for the time being the normal means of livelihood of utility and other industrial security dealers, but calls them into the service of the Government at great sacrifice of time and money and without substantial recognition. Moreover, the success of the two war loans was due in large part to a campaign of education conducted among millions of persons who never before had bought a bond and knew next to nothing of the nature of such a security.

Trained men from the bond houses performed this service, giving to it their whole time for weeks at a stretch, and when the public indifference at the outset of the canvass is recalled it is readily seen that the task was not an easy one.

This work laid the foundation for future war financing. The first loan was a success. The second was a greater success. When the third comes the public will know better than ever before the advantages it offers and will be in a position to absorb it readily. Meanwhile securities, like those of public utility companies, that form the lifeblood of industrial effort, should not be neglected or heedlessly shoved aside.

What is Non-Essential Electrical Business?

BUSINESS MEN everywhere are wondering what is "non-essential" business, and this applies with particular force to those branches of the electrical industry which deal with comforts and conveniences rather than plain necessities. No policy in this connection has been announced by the Government and the above question cannot be answered. When the occasion arises, no action except emergency action should be taken, except in accordance with some general plan based upon a thorough survey of industry, which, no doubt, has already been made. If unnecessary hardship is to be avoided, if there is to be no discrimination, the Government should not act until a general plan has been formulated and made known to the business of the country.

Before a business is classified as non-essential and deprived by act of Government of labor and materials, the industry through duly elected representatives should be given an opportunity to discuss the matter, and to learn the premises of the Government and the reasons for action. The motive of the Government—the concentration of industrial energy toward winning the war—appeals to all, and every industry can be relied upon to assist in bringing itself into adjustment with the war needs of the country.

If the Government acts in this connection with sufficient dispatch, the industries of the country may be given an opportunity to meet the needs of the emergency in a gradual manner and after deliberate planning. With English experience as a guide, and with the unhesitating support which business has given to the Government in the national effort, full opportunity is afforded for deliberate planning and adjustment.

Where an industry is regarded as non-essential and must be deprived of labor and materials, such deliberate planning may lead to the use of substitute materials or different processes of production. In this manner, unnecessary hardship may be avoided.

It should be a cardinal principle that the normal structure of business must be maintained during these abnormal times as far as possible. Therefore, consideration should be given to the possibility of allowing non-essential business a proportion of its requirements of labor and materials, so that some organization may be retained to be developed again upon the return of peaceful conditions.

Furthermore, when the Government is forced to deprive a business of materials and labor because it is non-essential, an effort should be made by the Government to place with the industry orders for product needed in the war. In this manner a helping hand may be given to business suffering solely through sacrifice for the common good. In this same connection it may be said that if men are to be withdrawn from industrial communities where they have houses and gathered in manufacturing centers already congested, there is created a great housing problem in connection with the production of war supplies. But if in placing war orders effort is made to produce war supplies in the centers where labor is housed, not only will congestion in munition centers be relieved, but there will be avoided at the end of the war the great problem of moving labor back to the normal producing centers.

One of the reasons for suggesting the formation of War Service Committees in industries was to bring about an early consideration of the above problems and to direct the attention of industries to the need in these abnormal times of preparing for diversified or unusual production to keep the industries intact during the war. Such committees could effectively present to the government authorities the manner in which industries might conform to war-time conditions. In a democracy it is certainly far better for industries to become adjusted to new conditions by co-operation between the industries and the Government rather than by objectionable compulsion.

HAPPENINGS IN THE INDUSTRY

Report of Jobbers' Convention—Meeting of New York Electrical Society—Electrical Credit Men Meet—Proportioning Lighting —New York Contractors Discuss Goodwin Plan—Other News

TRADE ACCEPTANCES AND GOODWIN PLAN DISCUSSED BY JOBBERS.

Semi-annual Meeting of Electrical Supply Jobbers' Association Establishes New Record in Attendance and Interest.

Discussions of trade acceptances and the Goodwin plan were the outstanding features of the semi-annual convention of the Electrical Supply Jobbers' Association, which was held at the Hotel Sinton, Cincinnati, Ohio, November 13-14-15. Following a comprehensive explanation of the application of trade acceptances to the electrical supply business, a committee, which was appointed to recommend specific action, reported that both from the standpoint of safeguarding their business and as a patriotic duty, every jobber should put the use of trade acceptances into effect at the earliest possible moment.

The principal address on this subject was delivered by Ernest De Brul, president of the Miller, De Brul & Peters Manufacturing Company, Cincinnati, who is also a member of the local Trade Acceptance Council. He first called attention to the excess profits tax and other special taxes, which will be due next spring, and to the difficulty there will undoubtedly be in securing cash with which to meet these payments. Banks are limited by law in the amounts which they can loan on personal notes and unless wide use is made of trade acceptances, the fullest utilization can not be made of the new Federal reserve banking system, which was designed primarily to meet just such conditions. Mr. De Brul explained the advantages of trade acceptances to both seller and buyer, particularly as they apply to conditions in the jobbing and retailing business.

In the discussion numerous jobbers reported that they had already put trade acceptances into effect and still others intended doing so. Mention was made of the value of trade acceptances to the electrical contractor, particularly in connection with payment for small wiring jobs. It was the consensus of opinion that such acceptances could be transmitted directly to the jobber for discounting in payment for merchandise ordered by contractors.

The convention was one of the best attended and most successful in the history of the association. Cognizance was taken of the national situation and a vote of confidence in the Government passed unanimously. The resources of the jobbers were also offered the Government in the matter of electrical supplies needed locally in any district for merchandise ordered by contractors.

The Goodwin Plan.

W. L. Goodwin was the principal speaker at the session on Wednesday morning, at which he explained his scientific plan for electrical merchandising, which provides for harmonizing the various electrical interests and is predicated upon a proper appreciation of the relations which should exist, between manufacturer, central station, jobber and contractor-dealer. He referred to the general acceptance of this plan by the contractors and dealers, who are now working on a new constitution, which has already been accepted by seven states and which will undoubtedly be in effect nationally by January 1. Mr. Goodwin also referred to the value to the central-station industry of having an organization of some 25,000 dealers and contractors working in harmony with the utility companies and molding public opinion in favor of private ownership and a wider development of electricity. He voiced the need of a code of ethics for the entire industry and the necessity for all other branches contributing to the development of the contractor-dealer, so that the industry may attain a maximum efficiency.

The meeting was attended by a number of contractors, this being the first meeting of the association at which electrical contractors were invited to be present.

Division Meetings.

The national meeting was preceded by meetings of the Atlantic and Central Divisions, held simultaneously on Tuesday, November 13. General conditions in the jobbing business were discussed, particularly dealing with the influence of the national situation on local business.

The Central Division paid particular attention to the high cost of handling orders and the need for a minimum service charge, or some alternative that would discourage unprofitable small-order business. Both divisions also endorsed the use of trade acceptances and there was a general exchange of ideas and practices in this connection.

TRENCH WARFARE AND ELECTRICAL COMMUNICATION DISCUSSED.

Joint Meeting of New York Electrical Society and Engineers' Club Attended by Over 1000.

A stirring and vivid talk on "Some Phases of Trench Warfare" by Lieut. Colonel Ivor Thord-Gray was listened to with intense interest by 1000 people at the joint meeting of the New York Electrical Society and the Engineers' Club in the Engineering Societies Building on the evening of November 15.

In a map put on the screen the trenches of the Allies and of the Germans were shown in close contiguity, with the No Man's Land between, and Colonel Gray told how the men in the section of the trenches which he commanded lived and fought. On one occasion his company made an attack on the German trenches, 100 yards away, but they were repulsed and had to leave 42 wounded men behind them. But soon they were reinforced and returned to the attack. They

drove the Germans out, but found 41 of their wounded comrades dead, pierced with many bayonet thrusts. The forty-second man, an officer, was still alive; but he was blind and died soon after. He was just able to tell them that when the Germans got to him they said, "We will give him a different dose." And with bayonets they gouged out both of his eyes. In concluding his address Colonel Gray made an eloquent plea for the active co-operation of every American while telling of "why we are at war."

The remainder of the evening was devoted to an address by Captain P. Corcoran, who told of the troubles and arduous work of the signalmen at the front in describing "Electrical Communication in Modern Warfare."

President McAllister submitted to the meeting for its approval some intended changes in the constitution. Secretary Guy announced that a handsome donation has just been made to the Society by Willard E. Case, of Auburn, N. Y. While the amount of the gift has not yet been made public—at the desire of Mr. Case—it is sufficient to defray all the liabilities of the Society and leave a substantial sum for the carrying on of the special work of the Society. Mr. Guy also stated that the membership committee, of which Walter Neumuller is chairman, was already engaged on an active and far reaching campaign, and that the Society looked for the largest accession to its membership in its history this season.

ELECTRICAL CREDIT MEN MEET IN CHICAGO.

War's Effect on Credit and Collections Discussed—Trade Acceptances Important Topic.

The twenty-second annual meeting of the Electrical Credit Association of Chicago was held at Hotel La Salle, November 15 and 16. At 11:00 a. m., the clan began to gather in the East Room to register and renew friendship ties. At 12:00 they went in a body to a luncheon of the Electric Club-Jovian League, Hotel Sherman, and there heard two inspiring addresses.

At 2:30 the business session convened in the east end of the Ball Room of the LaSalle, where the reports of the officers and committees were presented. The election of officers resulted as follows:

President, H. O. Clare, General Electric Company.

Vice-president, H. E. Wilkins, Belden Manufacturing Company.

National Board Member, B. P. George, Beardslee Chandler Manufacturing Company.

The membership has grown to 293, 38 new members having enrolled during the past year.

The secretary's report brought out the fact that the total number of slow and unsatisfactory accounts reported to the Association was 78,558, the aggregate amount of which is $5,963,612.66; that there were 620 fewer accounts reported this year than in 1916, and 1916 totaled 900 less than the year 1915. However, the amounts involved in dollars and cents this year showed an increase of $130,000 over the total reported last year. In a word, fewer accounts were reported this year than last but the amounts involved were larger than any year in the history of the Association. In a number of accounts reported adjusted to the Association the same facts held true—a decrease in number, but a substantial increase in the amounts adjusted, the total number of adjustments aggregating 45,930, involving $3,485,171.71.

The balance of Thursday afternoon was taken up with reports of territorial chairmen presented by E. W. Shepard of Cleveland, W. G. Clarke of Detroit, J. L. Hall of Indianapolis, E. Pfleger of Milwaukee, W. H. Vilett of Minneapolis, J. T. Dunnick of Columbus, G. K. West of Omaha, E. B. Daulton of Cincinnati, and W. J. Burton of St. Louis.

These reports were followed by a round-robin discussion on the meaning and effect of certain operative resolutions, led by Secretary Frederic P. Vose.

The annual dinner was addressed by Clarence S. Darrow, taking as his theme, "Our Country's Call," and Horace J. Bridges on the subject "Some Spiritual Gains of the War." The addresses were masterful, albeit the mentalities of the two speakers were singularly set in contrast as was the treatment of their respective themes and yet they were a unit in their conclusions.

All day Friday, from 10:00 a. m. until 5:30 was taken up with a discussion of the subjects set specially for that day. The one theme taking the greatest time and upon which the largest number participated in discussion was that of "Trade Acceptances, Merits and Faults," the discussion led by W. J. Burton. The other leaders of discussion, with their subjects, were as follows: Effect of War on Collections, Etc., by T. J. Whearty; Business Conditions, by E. W. Wolfstyn; Should Interest Be Charged on Overdue Accounts? by Davis McMakin; How to Handle Collection Correspondence, by J. W. Meriam; The Necessity for Observance of Terms at this time, by A. T. Bellis; Passing the Order and Helping Customers, instead of "Turning them down and making them pay," by E. T. Martner; Experience of Members with Customers Called to Colors, by Miss Eva G. Hansen.

PROPORTIONING GENERAL AND LOCALIZED LIGHTING.

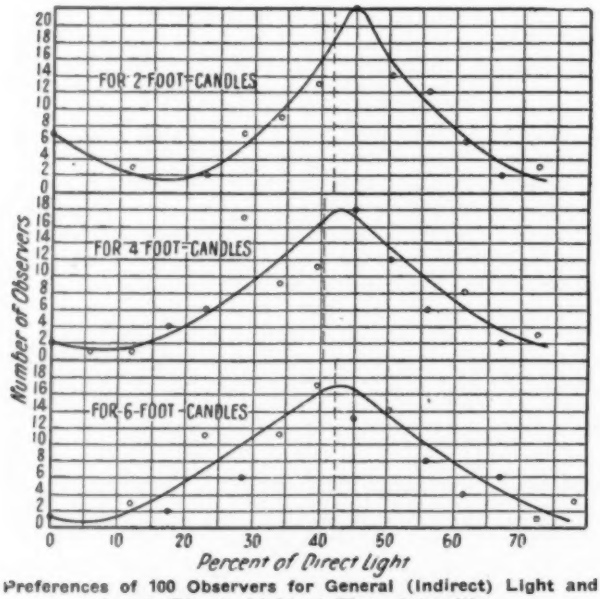
Test Results Presented Before Chicago Section, Illuminating Engineering Society.

As one step towards determining the desirable proportioning of general and localized lighting, F. C. Caldwell and M. H. Holmes, both of Ohio State University, presented a paper on November 15 before the Chicago Section of the Illuminating Engineering Society, reporting as to the results obtained in a test room 10 feet 6 inches square and 9 feet high. General lighting was obtained indirectly from lamps concealed in two wall boxes and projected against the ceiling by reflectors of a type commonly employed in show windows, this part of the lighting being so arranged as to produce a fairly uniform illumination of the ceiling. The localized lighting was furnished by a portable lamp housed in an opaque box lined with white paper and having a ground-glass bottom. Both the general and the localized lighting could be varied as needed, the aim being to determine the proportions of the two lighting methods which would give the most satisfactory illumination for a person reading a book and conscious of his surroundings. However, the term "satisfaction" apparently was not used by the authors of this paper as indicating the attainment of the maximum of eye-comfort, but rather as implying that combination of localized and general lighting which would produce the desired intensity of illumination on the working plane, while effectively avoiding unpleasant contrasts between the illuminated test object and the simple background of the walls. Indeed, each observer was instructed not to read, but merely to glance

at the paper of the book to see whether or not the reading conditions were good, and then to glance around the room (including the ceiling in his vision) so as to note the pleasantness of the surroundings.

Tests were made with three different intensities of illumination on the working plane, namely, 2, 4 and 6 foot-candles, respectively, and for each of the three series ten transition steps were used in passing from all general to all localized light, and four steps in a reverse order. With each series, a hundred observers passed judgment as to the proportions of localized and general lighting which suited them best. While the proportions thus preferred by different students varied considerably, by far the larger number chose from 40 to 45 per cent of direct lighting. The preferred proportioning was almost identical with all three intensities of illumination on the working plane, as shown by the accompanying chart in which the number of observers preferring each percentage of direct light is plotted after the manner of a probability curve. It will be noted from these curves that the choice was by no means unanimous, and that the personal opinions of the hundred observers ranged all the way from the seven who preferred exclusively general illumination for the lowest or 2-foot-candle intensity, to others who preferred fully 70 per cent localized lighting. However, the greater sharpness of the probability curve for the lowest intensity shows the more general agreement as to an approximate 45 per cent of localized lighting as implied by the peak of this curve.

Moreover, the preferred ratio was approximately the same for both men and women, and in preliminary tests on ten of the observers the preferred percentage of localized lighting was decreased only very slightly by changing the covering on the upper 6 feet of the walls from a lusterless black calico to a very light yellow wall paper; so that the authors conclude that on



Preferences of 100 Observers for General (Indirect) Light and Local (Direct) Light at Three Intensities.

the average, the color of the walls makes no important difference in the preferred proportions of localized and general lighting.

In the discussion following the presentation of this paper, attention was called both to the limitations of the test conditions and to the probable influence of custom on the preference as expressed for so large a percentage of localized lighting. Prof. E. H. Freeman attributed the common fondness for localized lighting partly to our historical use of fireplaces and other exposed lights of low intensity as the sole illuminants. He felt that allowance must be made in industrial lighting both for the scientifically desirable proportioning and for the tastes of the employees, as satisfying the latter was highly desirable.

O. L. Johnson reported from his own experience that with sufficient illumination to properly see his work, the workman when once accustomed to the same generally prefers the generalized lighting; also, that women usually prefer a larger percentage of generalized lighting than that selected by men.

Various speakers commented on the difference between the conditions of the test and the localized lighting as commonly found in factories and homes, where translucent reflectors are employed, instead of completely screening the localized lights by opaque reflectors and hence eliminating the specular reflection which ordinarily would have to be considered. Prof. Caldwell admitted that both specular reflection and eye fatigue had been ignored in this first group of tests, the aim having been to secure a momentarily pleasing illumination, rather than to provide good reading conditions for prolonged reading. However, he hoped to extend his tests to include semi-indirect lighting fixtures and other arrangements of localized lights. Meanwhile, he believed that general illumination usually gave the best results in factory lighting, except in cases where special classes of work required an intensity of illumination considerably in excess of 6-foot-candles.

SOCIETY FOR ELECTRICAL DEVELOPMENT CONSIDERS GOODWIN PLAN.

Board of Directors at Semi-Annual Meeting in New York Appoint Committee to Investigate Propaganda.

At the semi-annual meeting of the board of directors of the Society for Electrical Development, which was held at the headquarters of the Society in New York, November 21, a committee headed by James R. Strong was appointed to make a thorough investigation of the Goodwin plan and its effect on the various branches of the electrical industry and report to the board at a later meeting. Henry L. Doherty, Fred Bissell, Charles W. Price, are other members of the committee.

The meeting of the board was attended by H. B. Crouse, E. W. Rockefeller, F. S. Price, Fred Bissell, W. E. Robertson, J. R. Strong, Ernest Freeman, J. Robert Crouse, W. H. Onken and Charles W. Price, with President Henry L. Doherty in the chair. James M. Wakeman, general manager of the Society, presented a comprehensive report dealing with the activities during the past six months. This report was ordered printed and distributed to all members of the Society.

The treasurer's report showed a balance of $56,000 on hand.

Statistics compiled by the Society showed that the electrical industry is furnishing a large number of men for Government service, both in enlistments in the army and navy and for special and technical Government work. A report was presented respecting the Society's Christmas campaign, which is now under way, and all indications point to a very successful sales effort. An appropriation of $2500 was approved as part of the expense of flood lighting the Statue of Liberty in New York Harbor.

NEW YORK CONTRACTORS LISTEN TO GOODWIN PLAN.

Joint Meeting of Jobbers and Contractors Attended by 1500 Enthusiasts.

A mass meeting of the electrical contractors' associations and the unaffiliated electrical contractors of New York City was held at the Madison Square Garden Theater, New York City, November 20, under the auspices of a joint committee of New York jobbers and the contractors' associations represented on the adviosry board.

These associations, represented by two members each, are the Associated Electrical Contractors of New York City, Electrical Contractors' Association, Independent Contractors' Association, Kilowatt Club, Long Island Electrical Contractors' Association; Metropolitan Electrical Contractors Association, and the Watthour Club.

William L. Goodwin spoke on "Organization,' outlining the features of the Goodwin Plan. There were other addresses as follows: "Ideal Relation Between Jobbers and Contractors," George L. Patterson, Stanley & Patterson, New York City; "A Code of Principles for Electrical Contractors," Fred W. Lord, Lord Electric Company; "Relations With the Underwriters," J. C. Forsyth, New York Board of Fire Underwriters.

James R. Strong, Atlantic Division chairman on N. E. C. A. reorganization, spoke on "The New National Constitution and Its Purposes," and Louis Kalischer, chairman of the advisory board of New York contractors' associations, told of the work of the board during the year. Louis K. Comstock, president of L. K. Comstock & Company, was chairman of the meeting.

An unusual amount of enthusiasm was displayed by the 1500 contractors and jobbers who were present. To a man they seemed to be eager for the message that Mr. Goodwin brought. If the gathering on this occasion is indicative of a general feeling in the East, the plan is certainly taking hold in that section.

PERFECTING THE USES OF ELECTRICITY IN MINES.

Report on Electrical Investigations Conducted by the United States Bureau of Mines.

In the "Yearbook of the Bureau of Mines," just issued, there are included condensed reports of numerous important investigations conducted by this valuable governmental institution for the betterment of the mining industry.

During the past year the Bureau has developed a durable mine-lamp cord for the use of portable electric mine lamps. Up to the present time this part of such lamp equipment has been its weakest feature, and little success has seemed to attend the efforts of the lamp manufacturers to improve the cord. The Bureau solicited the assistance of the manufacturers of electric wires and cables, and after it had provided them with such information as it had at hand at that time regarding the best design to follow, its experts made tests of all of the different designs of lamp cords that the manufacturers submitted. The investigation is now complete, and 400 samples of 26 types of cord have been tested, involving a total of 47,000,000 slattings of the cords. The result of all this work has been the development of a cord 40 times as durable as the best cord tested prior to the undertaking of the research. This development means that the cord has been raised from the position of the weakest part of the lamp equipment to that of one of the most durable and reliable.

The operators of coal mines are adopting with surprising and gratifying rapidity portable electric mine lamps approved by the Bureau. It is probable that more than 100,000 approved electric lamps will be put into service in coal mines during the next 12 months.

During the year a set of proposed safety rules for the use of electricity in bituminous coal mines was proposed by engineers of the Bureau and published as Technical Paper 138. About 15 conferences were held between the Bureau's engineers and prominent mining engineers and coal-mine operators and a comprehensive research was made of the carrying capacity of bare copper wires for mine use. Many changes suggested by mine operators and by mining engineers of the Bureau were incorporated. The proposed rules have received favorable comments from some of the largest coal-mine operators, and have been reviewed and recommended for trial by the American Institute of Electrical Engineers.

The interest that has been manifested by mine operators in the development of storage-battery locomotives for mines and the fact that the use of storage-battery locomotives will eliminate the trolley wire (the most dangerous piece of electrical equipment in mines) has led the Bureau to undertake the preparation of specifications for explosion-proof storage-battery locomotives. Representatives from a large proportion of the manufacturers have conferred with the Bureau and professed their interest in its purpose and their intention of co-operating. They suggested that the Bureau prepare a set of specifications embodying the requirements that it considers to be essential for an explosion-proof storage-battery locomotive. These specifications are completed, and have been submitted to the manufacturers of storage-battery locomotives and to several of the larger coal-mine operators, whose co-operation has been solicited and promised.

Two types of explosion-proof coal-cutting equipment were completely tested, and approvals were issued to the Goodman Manufacturing Company to cover the 210 and 500-volt sizes of its type. In addition, approvals covering equipment of the Sullivan Machinery Company were extended to cover improvements.

The Sullivan Machinery Company developed, in co-operation with the Bureau, an unusually efficient and safe plug connection for use in gaseous mines. This plug constitutes a unique device for breaking with perfect safety in the presence of gas comparatively large electric currents at voltages not in excess of 650 volts.

For several years the Bureau of Mines has been developing an electrical methane detector. The results of the work have been gratifying and the detector promises to become a device that instantly will detect less than 0.25 per cent of gas. The sensitiveness and durability of the instrument are beyond question; some difficulty has been experienced in making the sensitive part of the instrument durable and reliable, but the results obtained recently have been encouraging.

BRITISH MINISTRY OF MUNITIONS HOLDS CONFERENCES.

New York Meeting Held Under Auspices of Mayor's Committee on National Defense.

Important conferences were held between the British Ministry of Munitions and various labor,

manufacturing and technical organizations on November 8 to 14, in New York City. The conferences were under the auspices of the Mayor's Committee on National Defense, and the visiting members of the Ministry were Sir Stephenson Kent, H. W. Garrod, G. H. Baillie and Captain Cyril Asquith, son of the former British premier. The mission had to do largely with questions involving the labor situation, and in five days 18 conferences, dinners and luncheons were held.

Among these meetings was one on November 13 of employers (metals, machinery, engines, boilers, motor trucks, airplanes, ships, railway equipment and supplies) at the Merchants Association, Commissioners Kent and Asquith attending; on the same day a luncheon was given at the Automobile Club by the New York Editorial Conference, all the Commission attending; at 7 p. m. Tuesday a dinner was given by the United Engineering Societies. On November 14 the program included a conference of employers (public utilities, electric light and power, traction, gas, telegraph and telephone companies) at the Manufacturers' Association, Commissioners Garrod and Baillie attending.

Great Britain Establishes Fund to Study Electricity in Agriculture.

The British Joint Board of Scientific Societies has a subcommittee on the application of science to agriculture. It was constituted to report upon the work at present in progress in this connection and to make recommendations to promote the application of engineering therein. The subcommittee has reported that it emphatically believes that a great future awaits the development of electrical applications to agriculture in England. Electric ploughs are found to be more advantageous than steam ploughs and the use of machinery has been stimulated by the dearth of farm hands. Not only has the introduction of electrically driven machinery partially met this need, but it has also made the task of very small farmers less strenuous. The report later says that apart from the advantage of saving or replacing labor electricity is advantageous to farmers through the low cost of maintenance of electrical apparatus, the absence of running expense when not being utilized, the rapidity with which it can be put in operation, its simplicity for handling, the facility with which the motor can be applied to the working of several machines simultaneously, its precision, its cleanliness, its freedom from danger of fire, and under normal conditions its comparative cheapness.

The subcommittee expresses the belief that electric power can be distributed at prices which would pay the farmer. It says that there is no question as to the economy of electric motors for stationary purposes and the important matter which requires practical experiment and proof is the application of electricity to ploughing, cultivation, reaping, binding, threshing, etc.

The recommendation is made that an experienced agricultural implement manufacturer and an experienced electrical plant manufacturer should design, construct and test practically an electrical tractor and possibly other agricultural machines. The Conjoint Board in October resolved to recommend the British Board of Agriculture to grant the necessary funds for this purpose and to appoint a delegation from its executive committee to carry the matter through and report.

CLEVELAND ELECTRICAL LEAGUE AIDS IN WAR WORK.

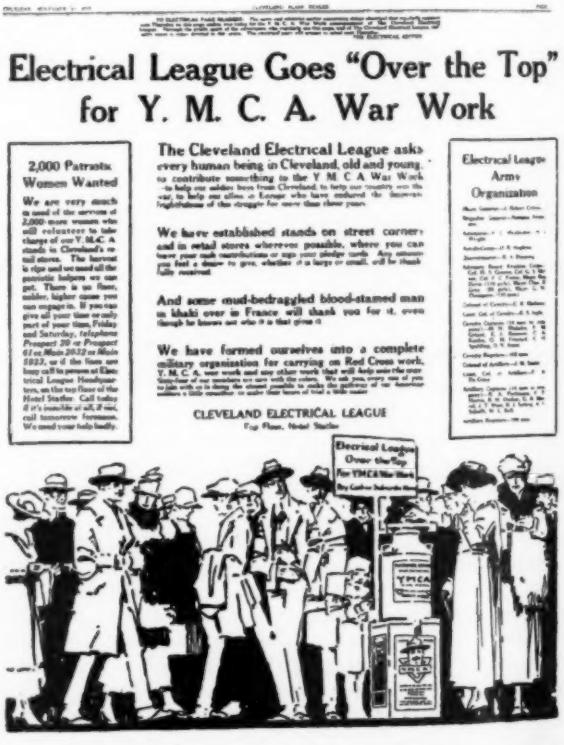
Comprehensive Campaign Undertaken to Raise Funds for Y. M. C. A.

The Electrical League of Cleveland, with permanent headquarters at the Statler Hotel, Cleveland, Ohio, has completed a campaign for the raising of funds for the Y. M. C. A., which has done much to establish it as an influence in civic affairs in the Ohio metropolis.

With a full appreciation of the need for raising the fund asked by the Y. M. C. A. authorities, the Cleveland league organized a number of teams, captained by well known electrical men and by means of these instituted a comprehensive effort to raise money which included personal solicitation from every industry in the city. The work was undoubtedly stimulated by friendly competition between the various teams, the day's results being published on the league's bulletin board, as well as in the daily papers. An interesting feature of the campaign was the co-operation received from nonmembers, particularly from the ladies.

The accompanying illustration is a reproduction of a full-page advertisement which appeared in the Cleveland daily papers and which gives an idea of the scope of the work undertaken by the league. At the time of going to press no actual results are available, although it is practically assured that the quota asked of Cleveland has been largely oversubscribed.

The action of the Cleveland electrical interests, through the local Electrical League, has done much


Electrical League Goes "Over the Top" for Y. M. C. A. War Work

2,000 Patriotic Women Wanted

The Cleveland Electrical League asks every human being in Cleveland, old and young, to contribute something to the Y. M. C. A. War Work.

We have established stands on street corners and in retail stores wherever possible, where you can leave your cash contributions or sign your pledge cards. Any amount you feel a desire to give, whether it is large or small, will be thankfully received.

And some mud-bedraggled blood-stained man in khaki over in France will thank you for it, even though he knows not who it is that gives it.

We have formed ourselves into a complete military organization for carrying on Red Cross work, Y. M. C. A. war work and our other work that will help save the poor fighting men of our nationality who are with the colors. We ask you, every man of you to join with us in doing the utmost possible to make the quotas of the American Red Cross and Y. M. C. A. under their banners of what a noble name!

CLEVELAND ELECTRICAL LEAGUE

Top Floor, Hotel Statler

Electrical League Army Organization

Electrical League Over the Top For Y.M.C.A. War Work

Full-Page Advertisement of Cleveland Electrical League.

towards focusing favorable attention on the electrical industry and could well be emulated by other leagues.

Norman Anderson is president of the league; Mathias Turner, vice-president; J. H. Scobel, treasurer, and R. S. Dunning, secretary.

NEWS NOTES

Production of Steam from Coal.—At the meeting of the Schenectady Section of the American Institute of Electrical Engineers, held on November 23, Alex Dow, president and general manager of the Detroit Edison Company, made a very interesting address on "Production of Steam from Coal." The meeting was exceptionally well attended to hear the authoritative presentation of this matter by Mr. Dow, who is not only an executive of a large central-station company, but also a prominent engineer.

California Association's New Officers.—The California Electric Railways Association has elected the following officers for the ensuing year: W. Clayton, president, who is vice-president and managing director of the San Diego Electric Railway Company, San Diego, Cal.; Paul Shoup, vice-president, who is president of the Pacific Electric Railway Company, Los Angeles, Cal.; Anglo & London Paris National Bank, San Francisco, has been appointed treasurer; W. V. Hill, 58 Sutter Street, San Francisco, is manager.

Further St. Paul Electrification Contracts Let.—The Chicago, Milwaukee & St. Paul Railroad Company has awarded contracts amounting to nearly $2,000,000 for electrical equipment for its new electrified division. The equipment contracted for includes 17 electric locomotives at an average price of about $100,000 each and substation machinery for the 216-mile Othello-Seattle-Tacoma division. The orders were divided between the Westinghouse Electric & Manufacturing Company and the General Electric Company.

Power-Plant Betterments at Reading.—The foundations for the addition to the Metropolitan Edison Company's West Reading (Pa.) power plant have been completed and erection of the steelwork has been commenced. The building now being erected is for the accommodation of the new 25,000-kilowatt turbine ordered some time ago for delivery next June, and two new 1000-horsepower boilers. This additional equipment will about double the capacity of the West Reading plant. The last of the new equipment of automatic stokers and coal-handling machinery is now being installed. The stokers will about double the steaming capacity of the boilers and will add greatly to the efficiency of the plant.

Provision Made for Coal Supply for Northwest.—To insure an expeditious supply of coal for Washington, California, Oregon, Idaho, Nevada and Utah, the United States Fuel Administration has appointed W. W. Armstrong state fuel administrator of Utah, to oversee distribution for those states.

Through this authority Mr. Armstrong may call upon neighboring districts in New Mexico, Colorado, Wyoming and Montana for only such per cent of their coal output as was shipped in 1916 into the states now under his supervision. Only shipments for emergency needs and not to exceed 10 per cent of the production of these districts can be obtained under his authorization.

David Whitcomb, state fuel administrator for Washington, will be authorized by State Fuel Administrator Armstrong to act for Washington coal mines.

Minneapolis Central Station Increases Rates.—The Minneapolis General Electric Company—one of the larger operating units of Northern States Power Company—has announced an increase in service rates effective January 1, 1918. After that date a temporary war conditions surcharge of 10 per cent will be added to power bills and 5 per cent to lighting bills. The executive committee of the Minneapolis Wholesalers and Retailers' Association has approved this action of the public utility company by unanimous vote.

Fifth Annual Foreign Trade Convention.—At the Hotel Gibson, Cincinnati, Ohio, there will be held on February 7 to 9, inclusive, the fifth annual National Foreign Trade convention. Although the detailed program has not yet been prepared, it is the intention to have the convention devote practically all its energies to the subject of winning the war—what is being done in the various industries, the part that foreign trade plays in this great task, the problem of the merchant marine, and a wise program for the future. As in previous conventions a considerable amount of time will be given to discussions in the form of questions and answers. O. K. Davis, India House, Hanover Square, New York City, is secretary of the National Foreign Trade Council.

Dallas Electric Club and Jovian League Resume Activities.—The Dallas Electric Club and the Jovian League at Dallas, Tex., are becoming active again, after the summer vacation period. At the meeting of the Dallas Electric Club on November 5 it had the pleasure of welcoming Harry Hess, who recently went to Dallas to assume the sales managership for the Western Electric Company, vacated by W. J. Drury, who has been made manager of that company's Cleveland branch. In responding to the welcome extended by H. Jalonick, in behalf of the Club, Mr. Hess spoke very effectively on the general prevailing conditions in the electrical merchandising work of the Southwest. Mr. Jalonick amplified the remarks of Mr. Hess, dwelling in particular on opportunities in Dallas that could be developed. H. S. Cooper, in discussing recent investigations of the Southwestern Gas and Electrical Association, brought out some very interesting points. W. G. Martin was elected secretary and treasurer of the Dallas Electric Club to fill an unexpired term.

Will Increase Power Equipment at Bangor, Mich.—The municipal steam-electric plant at Bangor, Mich., is having the two 80-horsepower boilers equipped with Jones automatic, underfed stokers, and it is probable that the 60-kilowatt generator, which has been in service 14 years, will be replaced by two new generators. A new engine will also be required to drive one of the generators, the engine now in use to be belted to the other generator. The plant, as now constituted, is overloaded by the requirements for general lighting service and for pumping 300 gallons of water per minute into the standpipe for city supply. In anticipation of new power equipment being installed, various small manufacturing concerns have signed agreements to use electric power, all amounting to about 100 horsepower. These comprise the planing mill, pickle and canning factories, feed mill and the fruit-packing association. Battery charging is now done at the plant, by taking current off the exciter set. P. M. Gross is superintendent, and A. K. Sauer is engineer in charge of the Bangor municipal plant.

Notes on Commercial Practice

New-Business Methods, Policies, Rates and Kindred Central Station Matters for the Man Engaged in Selling Electricity

HAMILTON (O.) MUNICIPAL PLANT OPERATED AT LOSS.

Engineers for City Report Deficit of $300,000 for Seven-Year Period.

According to a report submitted to the city of Hamilton, O., by Mead & Seastone, consulting engineers of Madison, Wis., the municipal plant of Hamilton has suffered an actual loss to the city during the past seven years of $300,000. The engineers declare that there has been a lack of proper business system in the administration of the plants. The engineers further declare the condition of these properties, both physical and financial, to be very unsatisfactory. The electric light plant is inadequate and antiquated. The engineers say that for the year 1916, while the reports show a profit of $23,872.03 for the waterworks, and a profit of $34,800.63 for the electric light plant with a loss of $433.12 for the gas plant, still, in fact, the analysis of the engineers shows that the waterworks lost $11,687, the gas plant lost $32,344, while the electric light profit was only $22,395.

The engineers point out that present conditions are due to lack of co-ordinate action between the operative and legislative branches of the city government, lack of observance of the state laws, and a generally bad administrative policy, apparently the result of political conditions, by which authority has been too general and responsibility too much divided.

SAVING 1,000,000 TONS OF COAL PER YEAR.

Utah Power & Light Company Publishes Striking Advertisement Showing Advantages of Hydro-electric Power.

In the accompanying illustration is shown a striking advertisement published by the Utah Power & Light Company, of Salt Lake City, in all papers in the state on Sunday, November 18, which has attracted wide attention.

The effect of this advertisement on the public in the territory served by the company is well exemplified by the many editorial comments appearing in the Utah dailies, of which the following is typical:

"This is neither an advertisement nor a boost. Rather it is an appreciation of a big work well done. The Utah Power & Light Company published an advertisement in Salt Lake Sunday newspapers that should be read and reread carefully by every citizen in the state for it points the solution of a very serious problem.

"For instance, the advertisement says that by hydroelectric generation of power the company is saving one million tons of coal each year, which is nearly one-third of Utah's production for the year 1916. One very important item was left out of the advertisement—those five hundred million kilowatt-hours of electricity were generated without the necessity of a pall of Pittsburgh smoke hanging over the city every day in the year—which doubles this hydroelectric blessing.

"And it is all the evolution of an idea. Years ago some genius discovered that our rivers in the intermountain country had a habit of running down hill

500,000,000 Kilowatt-Hours of Electricity
Saves Utah 1,000,000 Tons of Coal This Year
These Figures Tell the Story:
UTAH POWER & LIGHT CO.
EFFICIENT PUBLIC SERVICE

Striking Advertisement of the Utah Power & Light Company.

and that they showed a great deal of pep and speed in the running. One idea brought on another and crude harness was made for the rivers—they pulled grist mills, saw mills and such for a while and then came the big idea, electric power.

"Now up to the north of us is a very busy river. It tugs and tumbles and tears at everything that gets in its way and nothing has ever been able to stop it in its mad rush to bury its remains in Great Salt Lake. It's a Bear in fact and in name. It has enough power, pep and pull to jerk the pins from under the entire German army if it could get the leverage. That river is hog tied and harnessed by this Utah Power & Light Company. There are other rivers in the West that run down hill in a hurry and make a powerful noise —and one of these cold days there is going to be an abatement of the smoke nuisance, the car shortage and the coal problem and interested parties who have wasted considerable time in passing the buck are going to bank their fires hydroelectrically. Then everybody can have all the coal they want without argument."

RANGE SALES CONTINUE WITHOUT STIMULATION OF SPECIAL CAMPAIGNS.

Puget Sound Traction, Light & Power Company Reports Steady Increase in Installations.

The Puget Sound Traction, Light & Power Company, Seattle, Wash., is one of the most active agencies in the Puget Sound section in the sale of electric ranges but due to uncertain business conditions early in the year, no special campaign for the sale of ranges has been undertaken. Effort has been rather to exert a steady selling pressure through a few salesmen, and this policy has produced such good results to date that it will be continued throughout the year. Along with other companies the concern now considers the range business an all-the-year-round proposition.

The demand for ranges from persons not called upon by salesmen is increasing, and constitutes the best proof that "every range sold sells another."

There have been many inquiries for used ranges, probably due to the increased prices of new ranges, and it has been difficult to fill such orders. Those who are using ranges are generally too well satisfied to part with them.

Though about four fifths of its consumers are in the city of Seattle, about one third of all ranges sold by it this year have been placed in the suburban towns and country districts served by the company. No one appreciates the value of electric service more than the suburbanite.

It has for some time been difficult to get electric bakery ovens, as in one factory at least they have been commandeered for government training stations. Notwithstanding this the company now has in operation eight ovens in bakeries and restaurants, and in normal times could add largely to this class of business.

The sale of washing machines, due to scarcity of domestic labor, and of small air heaters, due to fuel price increases, have increased very largely over the corresponding period of last year, and the demand is still increasing.

The only adverse factor in the appliance market is increased prices on the entire list. Otherwise, everything indicates that the holiday trade will exceed that of 1916 by a good margin.

Co-operative Plan of Public Service Company of N. J. to Promote Sewing by Electricity.

The Public Service Electric Company of New Jersey has solved the problem of introducing the idea of sewing electrically in Home Dressmaking Week, November 5 to 12 inclusive. Mailing cards were sent out inviting women to visit their showrooms in the Public Service Terminal Building, Newark, N. J., during the week to meet the pattern and dressmaking experts from Pictorial Review Company, New York. These experts not only tell how to produce a well fitting garment, but they actually show the women how to do it.

The women are asked to bring their own material,

How to be Smartly Dressed
For Half The Money

THAT'S what Mrs. Peloubet and Mrs Lansing, expert dressmakers and fashion authorities from the Pictorial Review Company, New York, are going to tell you if you visit our showrooms during "Home Dressmaking Week."

And, they will not only *tell* you how to produce a well fitting fashionable costume with the proper lines, but will actually *show you how to do it.*

If you bring along your material they will cut out your garment for you, assemble the parts, and show you how to add the little finishing touches that give such distinction to a gown and are only found on very expensive garments from the exclusive shops.

You will be interested, too, in seeing how much time and work can be saved by the use of an electrically driven sewing machine.

Large Fashion Book Free

During "Home Dressmaking Week" we will give away to women only, while they last, 10,000 Pictorial Review Fashion Books, which regularly sell for 25c.

If you have any difficult dress problems to solve it is well to remember that you will receive more individual attention by consulting these experts during the early hours of the day.

PUBLIC SERVICE

Mailing Card Used in Sewing Machine Campaign.

the garment is cut out, the parts assembled and the little finishing touches added, and a large fashion book given away free. The women are then shown how much time and work can be saved by an electrically driven sewing machine. If they do not wish to part with their old machines they can get a small electric motor which will ease the work of sewing, or they can purchase one of the new electric sewing machines on easy payments.

The L. Bamberger Department store is co-operating with Public Service Company in supplying machines operated by the $15 electric motor.

The window displays are excellent and in keeping with the idea of sewing electrically which is so splendidly demonstrated in the showrooms in a big co-operative way.

CUSTOMERS REQUIRED TO PAY ALL INSTALLATION COSTS.

Cleveland Electric Illuminating Company Adopts Radical Provision to Finance New Installations.

Because of the almost prohibitive costs of labor and material and the difficulty of financing extensions and improvements under present market conditions, the Cleveland Electric Illuminating Company has adopted a new form of contract which requires the customer to pay all charges incident to the furnishing of service. The new contract, which became effective October 30, 1917, applies to all commercial loads in excess of five kilowatts capacity.

In effect the new ruling provides that any new customer must completely finance his installation, paying all costs entering into the furnishing of service from the station bus to the service entrance. A refund is made to the customer, in annual payments over a period of 10 years, based on the cost of the work as of July 1, 1914, and depending on the load-factor.

The new customers' charge applies in any instance where the company is required to make an expenditure for the installation or construction of the following:

Switching Apparatus.—For additional or specific switch gear, meters, instruments, panels, frames, control, cables and buses, connections and transformers, in switch houses or substations.

Subway.—For additional or specific subway from generating plant to substation, from substation to consumer's premises, from generating plant to consumer's premises, or from substation to substation, or from substation to point of feeding overhead line, or from existing distribution system to consumer's premises.

Cable.—For additional or specific transmission or distribution cable from generating plant to substation, from substation to consumer's premises, from generating plant to consumer's premises, or from substation to substation, or from substation to point of feeding overhead line, or from existing distribution system or transmitting direct to consumer's premises.

Overhead Lines—Line Extensions.—For additional or specific overhead lines, including poles or towers, with necessary and usual equipment, wire, lightning arresters, line switches, ground wires or connections, or for any work on existing poles or towers, with all the attendant equipment as aforesaid, for increasing the existing distribution system or transmitting direct to consumer's premises.

Transformers.—For any step-up or step-down transformers located in switch houses, substations, line houses or other structures, not otherwise specified.

Service on Consumer's Premises.—For the installation of poles, towers, lines, ducts, cables and vaults; also, where the transformer capacity to be installed exceeds 50 kilowatts, for the transformers and switches required, and for special transformers of 50 kilowatts capacity or less.

The above work is to supply kilowatts line capacity to the above premises, which capacity the company agrees to hold and reserve to the use of the applicant for ten years from the commencement of supply, subject to Federal, state, county, township or municipal regulation.

(1) The applicant deposits herewith the sum of ..... dollars ($....), which is the estimated cost of the above work, upon the understanding that the work constructed shall at all times be and remain the property of the Illuminating Company.

(2) Refund to the amount of ..... dollars ($....), which is the estimated cost of the above described work as of July 1, 1914, and hereinafter called the normal cost, will be made to the applicant, subject to the terms and conditions hereinafter specified:

(a) on the current taken and used by the applicant from the work constructed under this application; and

(b) in addition, on the current taken and used by other consumers connected to the line or lines constructed under this application, except where the work constructed consists of feeders or an addition to the network in the general distribution system of the company, in which event refund to the applicant will be made only on the current used by those consumers who are connected to that part of the work specifically constructed for the applicant which extends beyond the network in the general distribution system of the company; provided, however, that in no case shall the amount refunded to the applicant on the current used by any such consumer exceed the normal cost of that portion of the work constructed which is useful in serving such consumer.

(3) The amount to be refunded to the applicant shall be based upon the current taken and used within ten years after commencement of supply, but the total amount of the refund shall not exceed the normal cost of the work herein applied for.

(4) The refund will be computed at a rate per unit as determined by the following formula:

$$\text{Refund rate per kilowatt-hour} = \frac{\text{Dollars}}{36{,}000 \times \text{contracted kilowatt demand}}$$

The sum of money in the above formula is the normal cost of the above described work. The refund will be paid by the company to the applicant annually, subject to the conditions herein stated.

The kilowatt demand in the above formula is the capacity contracted for herein and reserved to the use of the applicant by the company.

(5) No refund nor interest shall be paid unless the applicant's bills for current have been paid in full; nor shall any annual refund payment exceed fifty per cent (50%) of the sum of the bills for the current taken and used within the refund period from the work constructed under this application as herein provided.

(6) The company reserves the right to refund at any time all or any part of the unrefunded portion of the normal cost of the specified work.

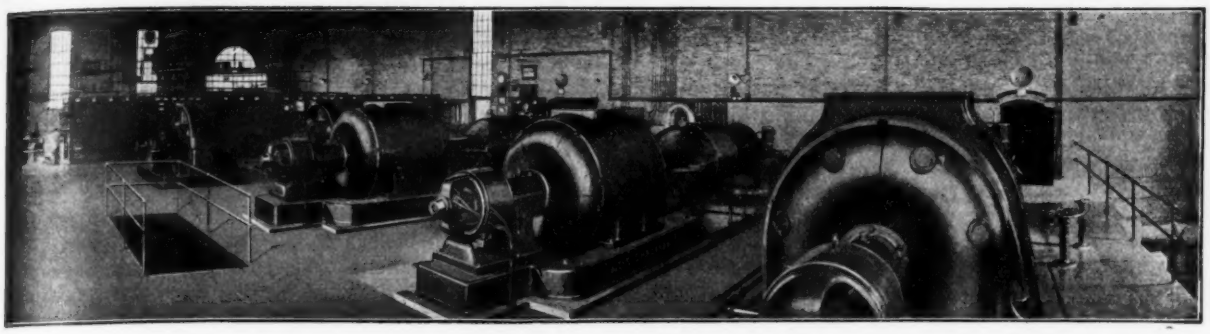
(7) No refund nor interest whatsoever will be allowed on the excess cost of the specified work, which excess is the difference between the normal cost and the amount deposited.

(8) Interest, not exceeding six per cent (6%) per annum, will be paid by the company to the applicant annually, upon the balance of the normal cost held at that time and subject to be refunded as herein provided. The annual rate of interest will be computed by the formula:

Rate = 6/10 of 1 per cent × average hours' use per day of the contracted kilowatt demand.

The hours' use per day of the kilowatt demand in the above formula shall be determined by dividing the monthly average of the kilowatt-hours upon which refund is allowed by thirty (30) times the demand contracted for herein.

(9) The interest and refund periods will be considered as terminating on the first day of February of each year, and payments shall be made to the applicant, as above provided for, upon the tenth day of the same month.



Notes on Operating Practice

A Department Devoted to Practical Problems of Plant and Operating Practice With Particular Reference to Electrical Generation and Distribution

HOW TO PROVIDE AGAINST OVERHEATED DUCT LINES.

Practice of Duquesne Light Company Described in Company Bulletin.

By W. A. Keating and Carl H. Mueller.

The rapid increase of the load on the 11,000-volt underground transmission system of the Duquesne Light Company, Pittsburgh, Pa., which commenced late in the spring of 1916, has brought about some operating problems that have required much study and time to solve. Previous to that time very little trouble had been experienced from overheated duct lines, with the exception of a few isolated cases of external heat from steam pipes and furnaces. But, with the operation of every cable at its maximum load, whole sections of duct line became so badly overheated that numerous failures of the cables occurred.

The effects of temperature on high-tension transmission cables is an interesting study. Cables must operate at a much lower temperature than any other kind of electrical apparatus to assure reliable service. It has been definitely determined by laboratory tests that the maximum safe working internal temperature of an 11,000-volt cable is 150 degrees Fahrenheit. Beyond that temperature a peculiar phenomenon is manifested. By reason of the high voltage a hysteresis effect occurs in the insulation and generates heat. Up to 150 degrees Fahrenheit this loss increases directly with the temperature but after 150 degrees is reached the curve takes a very sharp upward turn and quickly reaches a point where failure occurs. The safe operation, then, on a high-tension cable system, depends upon the ability to keep the internal cable temperature below 150 degrees Fahrenheit.

By laboratory tests it has been determined that the difference in temperatures between the duct wall and the copper of the cable is approximately 54 degrees Fahrenheit.

The number of cables in a given duct line and the character of the soil are determining factors in the amount of load the cables can carry. The characteristics of the soil determine the rapidity with which the heat can be dissipated; the number of cables determine the amount of heat to be dissipated. In general 35,000 kilovolt-amperes is the maximum any duct line should be called upon to handle.

One line is of particular interest in this connection. This line consists of ten tile ducts built two wide and five deep in which there are installed eight No. 4/0, three-phase, 11,000-volt cables. The street is narrow; its soil has poor heat-dissipating qualities and there are several rolling mills with annealing furnaces close to the street. Every cable in the run is called upon to carry from 200 to 220 amperes during the morning and evening peaks. The load-factor in the summer is about 50 per cent and winter about 75 per cent.

During the winter of 1916-1917 plans were formu- failures in this section, which is somewhat less than a mile long. All these failures occurred between June 1 and October 1. In order to relieve the situation, the manhole covers were removed and left off day and night during this period.

During the Winter of 1916-1917 plans were formulated for the coming summer for cooling this section if it should be found necessary. Two plans were discussed. The first, cooling by circulating water. Second, by air from motor-driven blowers. The first idea was abandoned on account of the danger of cable failures from defective cable sheaths, due to electrolysis, a trouble which has always been prevalent in this district.

The use of air blowers was not very favorably looked upon as there were so few vacant ducts in the subway that there was very little free air to move. As this was the only plan left it was decided to try it out.

Eleven blowers, each having a capacity of 612 cubic feet per minute, were built into wooden frames to fit the manholes. The duct line was wired in a spare duct with rubber-covered wire to supply current to operate the blowers. At first the blowers were arranged to draw the air out of the duct line but this overloaded the motors, due to the restriction of the passage of air through the duct line. The process was reversed and outside air forced into alternate manholes, the intervening holes being left open to allow the escape of the hot air. The effect produced is

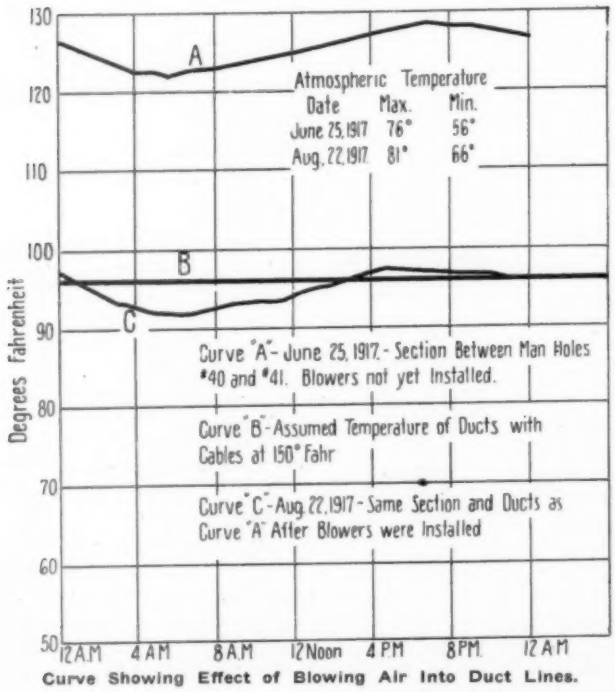
graphically shown in the accompanying curve. Curve (A) shows the temperature before blowers were installed, while curve (C) shows the temperature with the blowers operating. The average maximum temperature during the summer with the blowers running was 96 degrees Fahrenheit, which is just under safe operating temperature.

On October 1, 1917, as the weather had become considerably cooler, it was decided to shut down the blowers and close the manholes. This was done and within a week the temperature had increased from 96 degrees to 119 degrees Fahrenheit. The manholes were opened and the blowers replaced. This increase, occurring as it does with cooler weather, is due to the higher load-factor on the cables. As the load is constantly increasing, it may be possible that the blowers will have to be operated until very cold weather.

Only two breakdowns have occurred in the West Carson Street section since the blowers were installed and these two were due to individual overloads on the cables, caused by station failures on other parts of the system.

While the use of blowers is, no doubt, largely responsible for the decrease in the number of failures, the weather has been cooler this summer than during 1916. The load has been slightly less, due to the increase in the capacity of the transmission system at other points. The neutral has also been grounded and this, we believe, has aided in decreasing the number of failures in general as the voltage between conductors and ground has been decreased from 11,000 volts to approximately 6800 volts.

It may be interesting to describe, in closing, the method used for determining the temperatures in duct lines. The Duquesne Light Company has purchased



Curve Showing Effect of Blowing Air Into Duct Lines.

several indicating pyrometers, which record temperatures directly in degrees Fahrenheit by means of a change of resistance in a small coil which is drawn into the duct line at the end of a set of leads 250 feet long. These instruments are accurate within two degrees and are rugged enough to stand the service required of them. With them, surveys are made of all duct lines which may possibly become overheated and records kept of the temperatures. By this means we have been able to point out where duct lines are already loaded to maximum capacity and to advise that no more cables be installed in them.

We have attempted to use recording pyrometers built on the same principle as the indicating instrument but with little success. Such instruments are so extremely delicate that they will not stand the service required of them. We have, however, been able to secure a number of 24-hour charts at danger points, but we have been unable to put the instrument in regular use.

Peculiar Burnout on Waterwheel Generator.

A few weeks ago there developed a very peculiar and serious fault in a 3000-kilowatt, 11,000-volt, 25-cycle water-driven generator at an eastern water-power plant, which will result in the loss of this machine from the system for about two months.

On careful examination by the chief engineer and his assistants, it was found that a coil in the stator winding had become heated to the extent of bursting into flame. The vent fans caught in the coil and tore it loose from its position, at the same time fanning the flame through the rest of the machine, causing all inflammable parts to become ignited. The machine liberated itself from the system through a reverse-power relay, which operates at about ten per cent of the machine load, at the same time opening the oil switches at two other stations on two tie lines.

New coils which on receipt will require about one week to place, have been ordered for the necessary repairs and have been promised for delivery in two months. It was also necessary to scrape the rotor laminations to remove all effects of the fire. This operation has been completed so that on receipt of the new coils all that will be necessary is their installation. The accident occurred at a very unfortunate time because the peak load comes on at this time of the year, and nature had provided the river with a large quantity of water which might have been used to save coal.

This instance illustrates the desirability of placing among the windings of important generators exploring coils by means of which an abnormal temperature can be quickly detected before it develops into a dangerous breakdown.

New Coal and Ash-Handling Equipment Proves Economical at Easton.

The Pennsylvania Utilities Company, of Easton, Pa., has installed at its storage yard new coal-handling equipment which reduces the cost of handling coal in and out of storage to about one-third of the amount paid heretofore. New coal-storage equipment is being installed at the company's Dock Street plant which will greatly reduce the cost of demurrage by having to hold coal in cars as heretofore. A complete new ash-handling equipment has been put into operation, which reduces the cost of handling ashes to about 15 per cent of the former cost.

Arrangements are being made for a trolley connection between the Dock Street plant and the company's coal-storage and ash-dumping grounds. This work should be completed before the end of the year, and will facilitate the handling of coal and ashes by the use of trolley cars instead of by trucks.

Electrical Construction Notes

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

Anchoring Bolts with Molten Lead in New Concrete or Brick Walls.

By Ralph O. Bates.

The pouring of molten metals around bolts or other anchors fastened in concrete or brick walls is a job which takes considerable care and precaution because of the tendency of the metal to blow out if moisture is present in the hole. This, of course, endangers the eyes of the one who is doing the pouring.

On a recent job we had newly built concrete and brick walls to deal with that still contained a great deal of moisture. Having heavy apparatus to hang on the walls and not being allowed to run the bolts clear through and anchor them on the outside, we had to lead them in. This was safely accomplished in the following manner:

The holes were made somewhat larger at the inner end than at the outside. They were drilled to the required depth and then enlarged internally as suggested. As the walls were very damp we dried the shallow holes with a blow torch; then placed the square-headed bolts in the position we wished them to occupy. We placed moist clay around the bolt so that it formed a plug for the mouth of the hole and at the same time a funnel for pouring in the metal. Lead was used for this purpose and was melted by means of a gasoline furnace, such as plumbers use. Just before pouring the metal about a teaspoonful of powdered rosin was sprinkled over the surface of the hot metal in the ladle. This melted and as it is lighter than the lead it floated and was poured into the hole before the metal flowed in and seemed to form a coating over the sides of the hole before the metal touched them. This coating of rosin apparently covered over any moisture that might have been present.

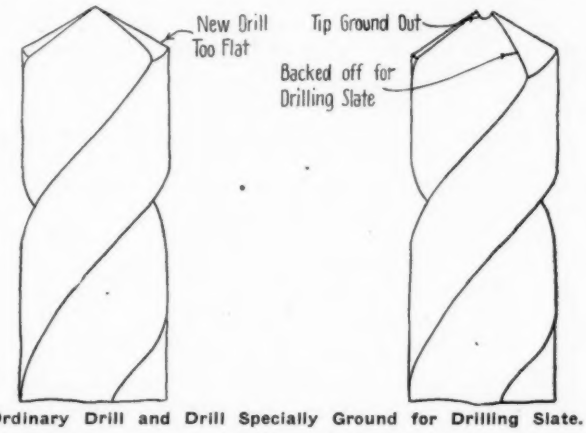
When the holes were too deep to be thoroughly heated with a blow torch, we first heated the bolts in a forge to a white heat and put them in place while at this heat. The heat from the bolts dried the holes and after the bolts had cooled to a blue color the metal was poured about them, as described above. This method proved very successful in our case. We had over 20 holes to be filled and these were all taken care of without any of the metal blowing out.

Efficient Drilling of Slate Requires Special Grinding of Drills.

By H. B. Stillman.

The secret of success in drilling slate for electrical or other purposes is the art of grinding the drills. There are many mechanics who can grind a drill of the ordinary style perhaps so that it will worm its way through the slate somehow, with more or less chipping or flaking out on the rear. But let an old slate driller sharpen the tool and it will eat its way through the slate with a clean, crisp cut and with very little chipping, and he will drill three holes to the others one.

A new drill is seldom properly ground for drilling slate. The point is too flat. It should be ground off or what is called "backed off" so that with a one-half-inch drill, for example, the back edge is at least one-



Ordinary Drill and Drill Specially Ground for Drilling Slate.

fourth inch lower than the front or cutting edge. The tip or point of the drill should also be ground out, leaving a groove from one-sixteenth to one-eighth inch deep, varying with the different sizes of drills. The only practical method of grinding out the tip is to use a thin emery wheel about one-eighth inch in thickness.

Boston Contractor Aiding Destroyer-Plant Construction.

Herbert S. Potter, electrical contractor, Boston, Mass., has received subcontracts covering the wiring of the plate and angle shop, angle smith shop, assembly building, boiler house and substation at the United States destroyer plant of the Fore River Shipbuilding Corporation, now under construction at Squantum, Mass. This contractor has handled all the temporary wiring construction, pole line and lighting work required at the plant in the past month, and with a force of about 100 men is pushing the installation of motor-driven tools, building wiring, etc., to rapid completion. The Boston Edison Company is supplying the energy to the plant.

All the electrical work in what will be one of the largest apartment buildings in the country is being installed by W. D. Gale, Inc., of Detroit, Mich. It is a composite structure known as the Lincoln Square Building and occupies practically the entire block on Ford Street, West, between Cavalry and Military Avenues, Detroit. It will have 110 five-room apartments, 14 stores, four office suites, a theater seating 2000 persons, and a six-story warehouse in the rear. The building will cost over $1,000,000.

AMONG THE CONTRACTORS

B. C. Johnson and Elmer Curnutt, of Garnett, Kans., have opened an electric shop in that city.

The new $100,000 high school at Ashley, Pa., will be wired by the contracting firm of B. P. McGroarty, Bennett Building, Wilkes-Barre, Pa.

Contract for the electrical work in the new $100,000 Y. M. C. A. building in Moline, Ill., has been awarded to the Tri-City Electric Company of that city.

George Thompson, Jr., Brooklyn, Wis., has bought the electrical business and stock of Pease Brothers, at Brooklyn. He will hereafter carry on the wiring work in the village.

A. D. George, a well-known electrician of Ironton, Ia., has sold his interests in the electrical business of George Brothers and will enter business for himself. He will erect a building shortly.

The large store and office building being erected at 1727 Pennsylvania Avenue, Washington, D. C., is being wired complete by the contracting firm of John R. Galloway, 907 Ninth Street, N. W.

Hawkeye Electric Supply Company, Iowa City, Ia., has dissolved as a partnership. Settlement may be made with C. C. Stephens or E. E. Kimmel. Mr. Stephens will continue to conduct the business alone, with new quarters at 213 South Clinton Street.

The Haffa Electric Company has been organized at Abilene, Kans., by R. J. Haffa and his brother, S. H. Haffa. They will carry a first-class line of electric fixtures and supplies. R. J. will look after the wiring and contract work and S. H. will have charge of electric light fixtures.

NePage, McKenny Company, with head offices in Seattle, Wash., and branch offices in Portland, Ore., and other Coast cities, has been awarded the contract for the electric wiring in the Medical School for the University of Oregon at Eugene, Ore., at a contract price of $5444.

The Grossman Electric Company, which last spring removed from Philadelphia to Allentown, Pa., has closed its office, owing to Louis J. Grossman entering Government service. Communications for Mr. Grossman should be addressed to his home, 503 Tasker Street, Philadelphia, Pa.

Peerless Electric Company, Chicago, has been awarded the contract for the electric wiring and other electrical work in the new eight-story building of the Union National Bank of Muskegon, Mich. A part of this work, it is understood, has been sublet to the Muskegon Electric Company.

John J. Schuitema, of Schuitema Electric Company, Muskegon, Mich., is installing two Allis-Chalmers motors of 50-horsepower each in the pumping station of Muskegon Heights. The motors are being direct-connected to two centrifugal pumps, by which water from wells will be forced directly into the water mains.

Nixon & Kimmel, electrical engineers and contractors of Spokane, Wash., have been appointed distributors for the Edison batteries and Edison farm-lighting plans for all territory east of the Cascade Mountains in Washington and all of Idaho and the western part of Montana. They are also distributors of the Robins & Myers motors, dynamos, the Sangamo meters and the Maloney transformers. Nixon & Kimmel have been located in Spokane for 20 years.

The F. E. Newberry Electric Company's Los Angeles branch has been awarded the contract for the electrical work in the J. B. Van Nuys Bank building on South Spring Street, Los Angeles, Cal.

A large factory to cost about $100,000 now being built at 5750 West Twelfth Street, Chicago, for O. C. Huffman will be equipped electrically by the Pierce Electric Company, 215 West Randolph Street, Chicago.

L. K. Comstock Company, 30 Church Street, New York City, has received the contract for installing an electrical power distribution system at the United States naval projectile plant being built at Charleston, W. Va. The contract amounts to about $13,500.

The Commercial Engineering Company, Philadelphia, Pa., has the contract for furnishing and installing the wiring and lighting systems in the new foundry, machine shop and electric shop at the Philadelphia Navy Yard. The amount involved is $26,919.

Standard Electric Equipment Company, contractor-dealer, of Red Wing, Minn., on January 1 will occupy larger quarters in the Red Wing Laundry Building, now being remodeled. A. P. Taber, of the company, states that the new location will be fitted up to meet the special needs of the electrical trade in Red Wing and vicinity, with latest and newest fixtures.

H. M. Desenberg, electrical contractor, Kalamazoo, Mich., has recently completed the wiring and installation of all lighting equipment for the new building of the First National Bank of that city, his contract amounting to about $3000. He has in progress the rewiring and placing of lighting fixtures in the plant of the Standard Paper Company, Kalamazoo, amounting to $10,000; and has lately completed similar work for the Standard Manufacturing Company's new plant at Kalamazoo, and installed 20 motors for electric drive.

Sundell Electric Company, Muskegon, Mich., which represents Western Electric Company in that locality, and is jobber for Chicago Belting Company, covering western Michigan, gives attention, as an electrical contractor, to the heavier class of construction. In this line of work, the Sundell company has about completed the electrification of the American Brass Novelty Company's works at Grand Haven, Mich., putting in 12 Western Electric motors, amounting to 126 horsepower. The company is putting through a contract for replacing steam equipment with electrical machinery in the plant of the Anderson Packing Company, Muskegon; the motors being put in consist of one of 20-horsepower for driving a group of meat-cutting machines and one of 25 horsepower, gear-connected to a single machine. The contract also covers lighting facilities and shafting. Another contract under way is the furnishing and installing of electric controlling devices, of the Cutler-Hammer type, for the Muskegon Engine Company, which had previously purchased motors for its shop. The Sundell company also has a contract for putting in a new lighting system for the Muskegon Boiler Works; in the change, two flaming arc lamps are being supplanted by 22 300-watt Sunbeam Mazda units with Benjamin angle reflectors. Albert T. Sundell, electrical engineer, is in control of the company.

The Dealer and Storekeeper

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Storekeeping for the Dealer in Electrical Appliances

HOW TO MAKE THIS CHRISTMAS AN ELECTRICAL ONE.

Unparalleled Opportunities for Electrical Dealers Who Capitalize on Utility and Economy of Electrical Appliances.

There are some pessimists to be found just now in nearly every line of business, including the electrical trade, who look for a decidedly poor Christmas business, as compared with normal years, basing their view on the fact that this is the first year the country has been at war. They point out that there has been heavy pressure exerted on the public to economize, and that this is bound to have an adverse effect on Christmas buying; hence, pessimism of the darkest hue.

In some lines, perhaps, this is justified. Although there is an abundance of money in the country, produced by an entire lack of unemployment and a high average of wages, it is undoubtedly true that the demands made by the Government in taxes and bond subscriptions, as well as the high cost of war-time living, have had a tendency to make the average American more thrifty than in former years. Thus, it is possible that concerns dealing in goods of a non-essential nature, or of a sort whose real usefulness is dubious, may find it more difficult than in the past to do a big Christmas business.

This very fact, however, should work out to the considerable advantage of those merchants whose goods fit in with the obvious trend of the public mind toward the useful and the practical; and of these the dealer in electrical goods and appliances is plainly one of the very first. With the past few years the Christmas demand for electrical goods, stimulated in many cases by good merchandising work on the part of the dealer, has increased greatly; and there is no reason why this season should be any exception.

One Dealer's Attitude.

"I have heard a good deal of talk among business men about poor business," said a progressive dealer in electrical goods recently. "I know, too, that some have made much smaller purchases in anticipation of the Christmas trade than they usually do. Maybe they're right. In fact, I don't think that there will be as many fol-de-rols bought this year as usual, because people are certainly learning that they must not throw their money away, when Uncle Sam is spending billions on the war. But Christmas is Christmas; the desire to give is there, and this means, in my opinion, that the giving will result in the sale of more practical presents than ever before; especially, it is going to help my line.

"Of course, the thing won't go of itself, and without pushing. I expect to do more aggressive work than usual, because of the possible reluctance of the public to buy, as well as on account of the proverbial lateness of Christmas shopping. I have already sold more flashlights, of a design practical for the use of soldiers, for example, than in an ordinary year's business, because I foresaw a demand for them for gifts for soldiers, and laid them in accordingly. Hundreds were bought for soldiers in France and at the various camps, and others will be bought as well.

All Lines Affected.

"I expect a big business in table and floor lamps, in irons and in electric cooking devices, and, in fact, in about everything I handle. You can hardly name a thing in my stock that isn't suitable for a practical gift, and such things as lamps, are, of course, beautiful as well. I am going to use newspaper space daily from now until Christmas, and I have already started holiday window displays. In other words, I am ready for a big business, I believe I am going to get it, and I am doing everything in my power to get it. And I shall be mighty badly fooled if I don't get it."

This is the opinion of a practical man on the subject—a man who has no rosy illusions about business, but who can see through a millstone, as the ancient saying goes, as far as the next. And he is firmly convinced, as the foregoing remarks may indicate, that he is going to handle a big business for the holiday season. The same reasons which appeal to him should appeal with equal strength to other dealers in electrical goods, inasmuch as circumstances the country over are much the same.

An Abundance of Money.

In the city where this dealer is located, for example, there are hundreds of factories. With very few exceptions, these concerns are running to capacity, many of them on orders either directly or indirectly connected with Government work. Men and women who work are receiving high wages, and their services are in demand. The withdrawal of some thousands of men from the city for army service has contributed to this effect; and, as the dealer suggested, he is also benefiting by this through the gifts which will be sent to soldiers serving abroad or at the camps in this country.

Take the smaller towns, as well; even those without any industrial activity are benefiting in a business sense by the unprecedented prosperity of the farmers; and as the modern farmer, thanks to that same prosperity and to the enterprise which has made it possible for small generating units to be provided for isolated dwellings, now has electricity at his disposal in many cases, this means a prolific source of business for the dealer in electrical supplies. Central-station companies operating in such towns have proved this abundantly, and in many cases their appliance departments show a better profit, considering the capital invested, than their general business.

An important factor in the sale of electrical goods this Christmas is their money-saving possibilities.

Practical Application of Trade Acceptance

Paul Tafel Electric Company Finding No Difficulty in Putting Plan to Effect—Discounts Allowed on 30-Day Acceptance

CUSTOMERS of the H. C. Tafel Electric Company, of Louisville, Ky., who have a good credit rating with that retail and jobbing house, have been receiving announcements of the company to the effect that it will hereafter make use of "Trade Acceptances." These announcements have been going out since the first of the month and have carried with them a number of blank forms of trade acceptances, together with a pamphlet discussing these new forms of commercial paper and a letter describing the manner in which they will be used, together with a new schedule relating to discounts and terms of sale by the company. The plan was developed by Paul C. Tafel, president of the company, and has received a great deal of attention from the company's customers and other jobbers in the section.

The letter to customers stated that the company, with a view to encouraging use of the trade acceptances, was willing to make liberal terms on account of their use. Terms of payment were divided into four classes, the first two relating to cash payments and the others to payment by acceptances. It is further provided in this letter that in cases of monthly statements not settled by payment or acceptances, interest from the date of the statement until paid would be charged at the rate of 6 per cent per annum. The four classes of settlements were described as follows:

(1) By paying our invoices ten days from their date, or by paying our total invoices twice a month, first to fifteenth by the twenty-fifth, and fifteenth to thirty-first by the tenth following, you will be entitled to all the cash discounts thereon, which are as follows:

Iron Conduits, BX, Outlet or Switch Boxes	5 per cent
Schedule Material (Sockets, Receptacles, Snap and Push Switches and Cutouts)	2 per cent
General Supplies Not Otherwise Specified, and Heating Devices	2 per cent
Rubber-Covered Wires and Cords	1 per cent

TRADE ACCEPTANCE

No. _____ Louisville, Ky., _____ 191__ $ _____

_____ after date pay to the order of H. C. Tafel Electric Co.,

_____ 100 DOLLARS

as per invoices _____

The obligation of the acceptor hereof arises out of the purchase of goods from the drawer.

To _____

_____

Due _____ 191__

H. C. TAFEL ELECTRIC CO.
INCORPORATED

By _____
President

Accepted 191__

Payable at _____

Town of _____

By _____

Date _____

DETACH AND KEEP FOR YOUR RECORDS

INSTRUCTIONS

Fill in Date

Name of Bank

Your Signature

A Trade Acceptance is not a note, but is an acknowledgment of the merchandise and the amount due therefor. Therefore, by signing this acceptance you merely acknowledge a debt in our favor for merchandise that we have delivered to you, you agreeing to pay on or before a certain date.

We can deposit this acceptance in our own bank, thereby giving us immediate use of the money already invested in the merchandise which you have in your possession, without extra cost to you.

According to a FEDERAL BANK GOVERNOR'S OPINION, the signing of an Acceptance increases the financial standing of the giver, because it shows prompt paying methods.

Kindly sign attached Acceptance, then forward to TAFEL ELECTRIC CO. INCORPORATED Louisville, Ky.

(OVER)

Trade Acceptance Blank Used by H. C. Tafel Electric Company, Louisville, Ky.

Weatherproof, Bare, Annunciator and Magnet Wire..½ per cent
Westinghouse Apparatus and Supplies (Except Heating Devices) .....Net

(2) By paying our monthly statement on the tenth of the month following, you will be entitled to a 2-per cent discount on everything except wires, cords and Westinghouse apparatus (except heating devices).

(3) If you are not in a position to pay our statement on the tenth of the month following, we will take a thirty-day acceptance from you covering the statement in full, and will credit your account with this acceptance and credit you besides with one per cent discount on everything covered by the statement except wires, cords, and Westinghouse apparatus (except heating devices).

(4) In case you need an extra thirty days, and will make arrangements for the additional time, we will take an acceptance from you due in sixty days for the total of the statement, which acceptance will carry no discount.

There is some further information in the same letter, relating the fact that the acceptances will not cost the customer anything to carry and noting that accounts amounting to less than $25 should not be settled by means of acceptances. This paper is discountable at local banks at the rate of 50 cents for 30-day paper and $1 for the 60-day paper.

Inclosed with the letter was the pamphlet referred to, a brief and clever exposition of what the trade acceptance is, with the title, "The Trade Acceptance vs. The Open Account." It will be of interest to the dealer and contractor as well as to the jobber, and reads as follows:

The use of trade acceptances in settlement of merchandise transactions is not new, as they have been, and still are, in common use in Europe, and were in use in this country up to Civil War times. They have been resurrected in this country for general business use, by our Federal Reserve Banks and their willingness to re-discount two-name paper that represents bona-fide transfers of merchandise of value.

Trade acceptances are similar to drafts in some ways, but are different in others. They are also similar to promissory notes in some ways, but are different in others. Trade acceptances represent a settlement for merchandise of value which has changed hands. Drafts, if accepted, would very often represent such a transaction, but more generally they represent debts incurred, which may be for merchandise, money borrowed, or transactions that have taken place months previous to the drawing and accepting of the drafts.

Acceptances should have endorsed on their face a statement that they represent bona-fide transfers of merchandise; such an endorsement is not necessary on the ordinary form of draft. The latter are commonly used to collect overdue accounts for merchandise sold, but trade acceptances cannot be used for this particular purpose. Trade acceptances are practically the same as drafts up to the point where the customer writes across the face of the acceptance a definite date of payment, the word "Accepted" and then his name. The promise to pay on a trade acceptance is equivalent to the promise to pay contained in a promissory note. However the promissory note is not intended to transfer funds as is the trade acceptance, but is intended to settle debts and to borrow money. A note is drawn by persons and a trade acceptance is drawn on persons.

Trade acceptances are an additional form of currency and in times of stringency of the money market will pass from hand to hand the same as currency, excepting that somewhere along the line some one has to pay interest. This item of interest in our case is paid by us.

Everyone realizes that there is not enough money in this country to do the tremendous business we do, and that in times of inflated business in the past we have often faced a panic, owing to the fact that money could not be realized out of the credits extended. With the organization of the Federal Reserve Bank for the purpose of meeting this condition, and its approval of trade acceptances and willingness to discount same, and the adoption of their use by the business men of this country, this danger will be overcome, as these acceptances can be handled the same as so much additional currency.

Local banks which discount these trade acceptances have in their possession assets which can, if necessary, quickly and easily be converted into cash, and they therefore constitute an additional reserve to the banks carrying them.

The acceptance forms inclosed in the letter are drawn in the approved form, the sheet measuring 7 by 8½ inches. It is perforated in the middle, lengthwise, with directions on the lower half as how the acceptance is to be filled out, and a duplication of the acceptance on the reverse side of this lower half, which is intended to be detached from the acceptance tendered in settlement of the account and filed for reference of the customer making such settlement. In red ink on this lower half are pointers noting the dotted lines on which the date is to be filled in, on which the name of the bank is to be written and on which the customer's signature is to be written.

Under the caption of "Instructions" on the lower half of the sheet, below the perforations, are the following directions:

"A trade acceptance is not a note, but is an acknowledgment of the merchandise and the amount due therefor. Therefore, by signing this acceptance you merely acknowledge a debt in our favor for merchandise that we have delivered to you, you agreeing to pay on or before a certain time.

"We can deposit this acceptance in our own bank, thereby giving us immediate use of the money already invested in the merchandise which you have in your possession, without extra cost to you.

According to a federal bank governor's opinion, *the signing of an acceptance increases the financial standing of the giver,* because it shows prompt paying methods.

This development has been discussed with much interest before the meeting of the Louisville dealers and supply houses, and it was also up for discussion before the recent meeting of jobbers of electrical supplies and appliances held at Cincinnati. At this meeting standardization of discounts was considered in addition to the use of trade acceptances.

Kentucky Company Withdraws Application for Rate Increase.

The application of the Kentucky Public Service Company at Bowling Green, Ky., for an increase in rates for electric lighting service has been withdrawn, on discovery that the advance could not be permitted by an ordinance.

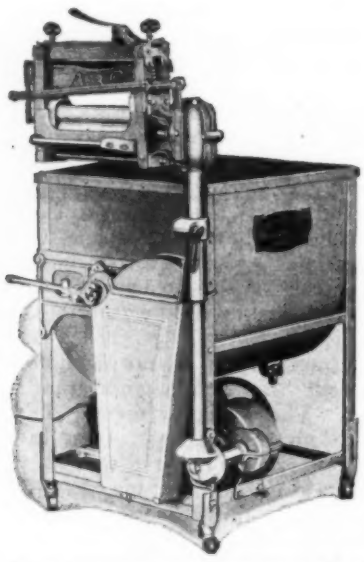
The company has consequently advised the city that it will continue providing service at the old rates, in the hope that the cost of fuel and other necessities will decline, or until it becomes imperative that higher rates be obtained.

Electrical and Power Appliances

A Review of the Latest Developments and Information Respecting Electrical and Kindred Mechanical Appliances

New "A. B. C." Electric Washer.

One of the oldest manufacturers of washing machines has recently placed on the market a new type of electric washer, which is built entirely of metal, with the exception of the frame of the wringer and the cylinder in which the clothes are washed. This cylinder is made of 2-inch wood slats, placed about ¼-inch apart around the circumference of a drum, the slats being perforated with ½-inch holes. A portion of the



"A. B. C. Super-Electric" Washing Machine.

cylinder is hinged, forming a lid so that the clothes may be readily put in and removed. The cylinder is given a full revolution before it reverses, thus giving the clothes an opportunity to be thoroughly mixed with the soapy water. The machine has an angle-iron framework, with a platform below, upon which the motor is mounted. The motor is a ¼-horsepower machine and drives by means of an adjustable belt. The shaft connecting with the wringer and all of the gearing is entirely inclosed.

The wringer is mounted on an upright metal arm that adjoins one corner of the machine. The wringer is arranged so that it can be swung to any direction and locked in place. It has a patented safety release, which permits the operator to stop wringing immediately if the clothes should become choked between the rolls; this is done by merely pressing the lever that can be seen on top of the wringer. The machine itself is controlled by means of a lever that is conveniently placed at one side. The top of the machine, as well as the entire body, is made of substantial sheet metal and highly finished to make an attractive outfit. The cover can be readily removed so that the clothes cylinder is quickly accessible; the cylinder also can be entirely lifted out so as to expose every portion of the interior of the machine.

This machine, which is known as the "A. B. C. Super-Electric," is said to be entirely foolproof and to give exceptionally rapid and thorough washing. It takes only a few minutes to learn to operate it. It is mounted on easily rolling castors and when not in service the wringer can be swung over the machine and the top of the machine itself used as a shelf or table. This washer is manufactured by Altorfer Brothers Company, Peoria, Ill.

Motor-Operated Space-Band Cleaner.

The List Manufacturing Company, Clare, Mich., has developed a machine to clean automatically space bands used with linotype machines. This machine also graphites the bands. Unless the bands are kept free the work of the linotype machine is imperfect and the machine itself deteriorates.

Since cleaning the space bands by hand tends to flatten them and leads to imperfect casting, the List company's machine was developed. It cleans and graphites 50 space bands per minute and is actuated by a fractional horsepower motor manufactured by the General Electric Company. These motors are standard equipment and operate on the currents obtainable from an ordinary lamp socket.

New Hubbell Porcelain Receptacles.

To an already extensive line of receptacles the firm of Harvey Hubbell, Inc., Bridgeport, Conn., has recently added three new porcelain types. These are all arranged for quick installation. They are illustrated herewith, the first one being cleat receptacle No. 9171, which is supported by one screw inserted through its center. The next one is another type of cleat receptacle, designated as No. 59,275; this has lugs on each side to accommodate wiring raised 1 inch from the surface. The third receptacle is known as No. 61,988 and is a special receptacle for conduit-box and metal-sign work. It is constructed with five notches in the base. Bending any one projection from the metal plate into any one of these notches guarantees having a permanent and rigid mounting for the receptacle after it is once in place. Another feature of this receptacle

New Hubbell Cleat and Sign Receptacles.

is the screw ring which permits the removal of the shell without disturbing the wiring. Each of these receptacles is allowed the liberal rating of 660 watts, 250 volts.

Small Drum-Type Reverse Switch.

One of the latest products of the Westinghouse Electric & Manufacturing Company is a small drum reversing switch for operating motors in machine-tool, woodworking and other services requiring reversing of the motors. The small size and neat appearance of this reverse switch make it especially adapted for mounting directly on the machine. Notwithstanding its small size, this switch is exceptionally rugged and has proven successful on the most severe services.

A terminal board of heavy Micarta forms the back of the switch, and on the front side of this board are mounted the stationary contacts. The movable contacts are mounted on cast brass brackets clamped on the shaft, from which they are thoroughly insulated. Good contact is insured by phosphor-bronze springs on the movable contacts, these being protected by copper shunts.

Heavy barriers of asbestos lumber separate adjacent sets of contacts so that cross-arcing is impos-

Westinghouse Drum Reverse Switch.

Interior of Drum Reverse Switch.

sible. All live parts are protected from exposure by an inclosing cover of sheet steel, lined with asbestos, and held in place by two ring latches, which permit its easy removal for inspection or renewal of contacts.

These switches are made for alternating-current or direct-current circuits. For alternating-current service and for direct-current service without dynamic braking, they are provided with "forward," "off" and "reverse" positions. For alternating-current service the motor is connected directly across the line.

For direct-current applications with dynamic braking, the switch handles have five positions as follows: "forward," "drift," "off and brake," "drift," and "reverse." They may be used with automatic starters for shunt and compound-wound motors. With compound-wound motors having heavy series winding for tail-stock and cross-rail service, they may be used to connect the motor directly to the line, either with or without resistors permanently connected in series with the armature.

When remote mechanical control is desirable, both alternating-current and direct-current switches can be furnished with extended shaft permitting either gear or sprocket operation.

Safety in Starting Squirrel-Cage Motors Secured by a New Switch.

By R. E. Brown.

Anyone who has had practical experience in a furniture factory, woodworking shop or other plant where constant-speed induction motors are used, realizes the necessity for having some starting mechanism which will provide the machines with protection against overload and against any unexpected restarting after there has been an interruption in the circuit or failure of voltage. This is accomplished by the new inclosed starting switch illustrated herewith.

New Inclosed Switch Used in Starting Small Squirrel-Cage Induction Motor Shown Mounted Above.

It insures safety to the operator under all conditions, because he cannot touch a live part while operating the switch, nor when inspecting or renewing fuses. The sliding panel, which incloses the contacts and fuses, interlocks with the mechanism so that the switch cannot be closed and the fuses are always dead when the sliding panel is in the lowered position. With the panel in its closed position the starting handle may be operated. The fuses are not in circuit when starting, but are automatically included in the motor circuit when the starting handle reaches the running position. The fuses can therefore be of sufficiently low capacity to give proper protection to the motor windings while running. Failure of voltage causes the switch to open. Unexpected restarting with the resultant possibility of injury to operator or machine driven is prevented, because to again start the motor it is necessary to operate the starting lever.

The interior parts consist of three moving contact fingers, which, when the starting lever is moved to

the extreme upward position, make contact with three stationary contacts, connecting the motor directly to the line. This is the starting position. After the motor is up to speed the hand is removed from the handle and the contact fingers slide into engagement with the running contacts, the change being made without opening the motor circuit. The capacity of this standard switch is 3 horsepower, 110 volts, and 5 horsepower, 220 volts. It is designed and made by the Cutler-Hammer Manufacturing Company, of Milwaukee, Wis.

Inclosing Panel of Switch Partly Lowered. This Interlocks Switch in Open Position.

Inclosing Panel Removed, Showing Interior of Safety Motor-Starting Switch.

Standard Unit Switchboard Panels Prove Suitable for Many Plants.

There are many power-station operators today who still remember the time when electrical power was in its infancy—the time when controlling devices were so inadequate that the knife switch opened with a flaming arc in its trail, an arc which was then beaten out with a leather thong. In those days it became evident to many that electricity must be better controlled, if its best promises were to be fulfilled. Inventive genius was set to work to produce improved devices for the control of every sort of current, and in time the modern switchboard was evolved.

After the slate or marble panel, with its controlling and measuring instruments and its tripping devices for opening circuits at a sign of danger, was firmly established, a need for a uniformity in material, size and equipment became evident. However, it was thought by many that a complete standardization, such as had revolutionized the industries and trades, would be impossible in switchboard manufacture.

Switchboard specialists saw things in a different light. To substantiate their views they had the experience of thousands of cases which showed conclusively that most control needs fell into distinct classes whose requirements could be met by standardized material. Thus it happened that there was developed a complete classification of switchboard needs together with a standardization of the apparatus manufactured to meet these needs. Panels became units and thousands of them were catalogued.

Today it is possible for station owners and users of electrical power to order switchboards of a great many sizes and capacities directly from a catalog. Much of the worry, delay and expense of specifications and drawings has been eliminated and in its place stand the advantage of quantity production and concentrated skill in design. Of course, various cases still exist which require individual switchboard engineering, but a great many switchboard conditions may be met by these so-called "Standard Unit" panels. Because of this and because of the saving in time, trouble and money which results from their use, standard unit panels are said by some engineers to be one of the greatest advances in the switchboard engineering of recent years.

The accompanying illustration shows a typical installation of such ready designed switchboard panels. It is in the hoist house of the Greensburg Coal Company. The panels in this case control a 200-kilowatt synchronous motor-generator set supplying energy to a reversing hoist. The control of this equipment and of other apparatus in this plant is readily effected through the standard panels made by the General Electric Company, Schenectady, N. Y.

Typical Installation of Standard Unit Switchboard Panels.

Activities in the Trade

Industrial Engineering Company, Shamokin, Pa., has been awarded a contract for the installation of motors, lighting and pumping system, line shafting and heating in the new silk mill now in course of construction at Nuremberg.

Wagner Electric Manufacturing Company, St. Louis, Mo., announces the opening, on November 15, of a sales office at 116 Auburn Avenue, Atlanta, Ga., in charge of Charles M. Welch, formerly Indianapolis branch office manager.

P. & B. Manufacturing Company, Inc., Milwaukee, Wis., manufacturer of electrical fittings, announces that its corporate name has been changed to the A. H. Petersen Manufacturing Company. No changes in policy are involved. A. H. Petersen has become president of the company.

Westinghouse Lamp Company, Trenton, N. J., is now operating its new factory there, which is equipped to produce 50,000 lamps a day, with an ultimate capacity of 75,000. The company now has four factories making incandescents, the other three being located at Bloomfield, N. J., Milwaukee, Wis., and New York City.

Edison Storage Battery Company's New York sales office is now comfortably located at 209 West 76th Street, which are larger quarters than the former location, 206 West 76th Street, on the opposite side of the street. In the enlarged and improved quarters the company is in better position to care for its increased business.

Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has just published a 100-page booklet containing reproductions of letters received from motorists giving opinions on the C-H magnetic gear shift. The letters are photographically reproduced and are interesting in that they indicate a well defined liking by the motor-car driver for preselection of speeds as provided by the C-H magnetic shift.

The Spencer Turbine Cleaner Company, of New York, which equipped the tallest office building in the world, will install a system of vacuum cleaning in the new Hotel Commonwealth, New York City, which is to be the largest hotel in the world. The system to be installed in this 2500-room hotel will consist of a central plant in the subbasement, from which a system of piping will extend to several hundred stations.

Edgcumbe-Parks Company, Benton Harbor, Mich., carrying on the manufacture of concrete drain tile and building blocks, also make a specialty of artistic concrete products. This comprises six or seven designs of lighting posts, for single-light, three and five-light installations, of modern, Ionic and Doric designs. They combine lasting utility with attractive appearance. Light posts of these designs are in service on the streets of Benton Harbor and St. Joseph.

Standard Underground Cable Company, with factories at Perth Amboy, N. J., Pittsburgh, Pa., and Oakland, Cal., the largest manufacturer of marine cables in the world, is supplying the cable to be placed for the transmission of electricity from the Southern Railway & Light Company's plant at Natchez, to Vidalia, Miss. The cable weighs 30,000 pounds, is 3000 feet long and is composed of three No. 4 copper wires, heavily insulated. It is covered with lead, and has an outside armor of steel.

Reynolds Electric Company, with main office and factory at 422-430 South Talman Avenue, Chicago, Ill., and eastern office New York City, is sending out an illustrated folder, telling how to economize on electric light expenditures, including lighting of sign boards, and consequently saving coal, without cutting off electricity for signs and at the same time increasing advertising effectiveness, by using its Reco flashers and reflectors. The Reco flasher is made in all sizes and types, for displaying with lights on and off, spelling, lightning, script and many other effects. The company advises coloring signs with the national colors, red, white and blue, by the use of its slip-over color hoods, of which one is illustrated.

Standard Underground Cable Company, Pittsburgh, Pa., has issued Bulletin 700-2. This deals with outdoor cable terminals of the D. O. A. type. These terminals are made in a variety of single and multiple-conductor types and include a disconnecting feature, which has been found of great value in distributing networks. A brief description of one of these types was published in our issue of November 3. The bulletin is very well illustrated and gives valuable hints on the use of cable terminals of this type.

R. D. Nuttall Company, Pittsburgh, Pa., has issued a well illustrated booklet entitled "Nuttall Industrial Products." This deals particularly with the well-known types of Nuttall gears, which are made for spur, bevel, worm, herringbone and special gear driving. The construction of typical gears of these types is described and illustrated and special attention is given to the properties of Nuttall gears, due both to the materials used and to the treatment given them during manufacture. Valuable gear data are given on a number of pages.

Duluth Becoming Important Electrical Center.—Duluth, at the head of the Great Lakes, is coming into its own as a recognized electrical center, dominating the industrial development of the Northwest. At the present time the following electrical firms, distributing electrical supplies, are located in Duluth and the adjoining city of Superior: Burgess Electric Company, Northern Electric Company, Northwestern Electric Equipment Company, Lake Superior Electrical Company, Universal Electrical Appliance Company and the Marshall-Wells Hardware Company. As noted in a recent issue, the Northwestern Electric Equipment Company, whose main office is at St. Paul, has just established district headquarters with large warehousing facilities in Duluth.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently prepared a number of new publications, of which Catalog 8-D describes Westinghouse automatic electric ranges; these are made with a clock-controlled automatic switch, which can be set so as to open the circuit at any desired time; details of the various parts of the range are fully described. In a supplement to Catalog 4-B is described a new type C induction feeder-voltage regulator, which is produced for use in outdoor substations and the like. A special publication (No. 1582) deals with Westinghouse electrical apparatus for the electrochemical industries. Among equipment particularly described are synchronous converters, motors, electric furnace equipment, special high-voltage equipment for the Cottrell electrostatic precipitation process, and power-plant equipment in general; a considerable number of illustrations are shown. Leaflet 1295 describes four-frame type CS motors for use in textile mills. Leaflet 1750 describes type A magnetic brakes for alternating-current motors.

B. F. Goodrich Rubber Company, Akron, O., announces that the 1918 edition of "Motor Trucks of America," of which S. V. Norton, manager of truck-tire sales, is the author, will be ready for distribution on January 1. The book, consisting of 200 pages of reading matter, illustrations and specifications, is the sixth to be issued in as many years. Complete specifications of nearly 150 of the leading gas and electric-driven motor trucks are contained in the volume. In fact there are 31 specifications for each model. These details are absolutely dependable as the approval of each truck manufacturer is obtained before specifications of his model are inserted. For the reason it offers opportunity to the buyer and manufacturer to compare models, lists all makes according to sizes and affords a perspective on changes of design by comparison with previous editions, "Motor Trucks of America" is accepted throughout the motor world as the one complete and authentic handbook of the truck industry. The illustrations, too, add much value to the book. They picture the very latest models and furnish the man in the market for a truck, or the manufacturers themselves, for that matter, suggestions for special bodies for particular line of work.

Latest Approved Fittings

The electrical fittings listed and described in this department have been approved by the Underwriters' Laboratories, Incorporated, after examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

Attachment Plugs, Fuseless.—Pass & Seymour, Inc., Solvay, N. Y.

"P. & S." non-separable attachment plugs, 3 amperes, 125 volts, 1 ampere, 250 volts, catalog No. 1231.

3 amperes, 250 volts, catalog No. 1232, with pull-switch rosette.

Listed October 8, 1917.

Lamp Adjuster.—Cincinnati Specialty Manufacturing Company, Powers and Sylvan Streets, Cincinnati, Ohio.

An automatic reel with portable flexible cord and weatherproof socket.

Listed October 19, 1917.

Lighnting Rods.—Miller Lightning Rod Company, corner Third Street and Geyer Avenue, St. Louis, Mo.

Listed October 19, 1917.

Outlet Bushings and Fittings.—Appleton Electric Company, 212 North Jefferson street, Chicago, Ill.

Pressed-steel connector for armored cable designed for ⅝-inch knockouts, catalog No. 8,100.

Listed October 8, 1917.

Outlet Bushings, Service Entrance.—Frankel Light Company, 5016 Woodland Avenue, Cleveland, Ohio.

"Ohio" porcelain fitting having separate openings for wires, secured to under face of cast-iron cover attached by threaded bushing to rigid conduit; ⅜ to 1-inch sizes inclusive.

For use only at exposed end of conduit (but not under fixture canopies) and only where conduit wires pass out through fitting without splice, joint or tap within fitting.

Listed October 5, 1917.

Receptacles for Attachment Plugs, and Plugs.—Central Electric Company, 316-326 South Fifth Avenue, Chicago, Ill.

"Ralco" 100 amperes, 125 volts, catalog No. 14.

For use in series with switches and not for closing or opening circuits under load.

"Ralco" 30 amperes, 440 volts, catalog Nos. 4B, 104.

5 amperes, 600 volts, catalog No. 21.

10 amperes, 600 volts, catalog No. 27.

15 amperes, 600 volts, catalogs Nos. 23, 216.

60 amperes, 440 volts, catalog No. 119.

200 amperes, 125 volts, catalog No. 26.

Listed September 14, 1917.

Receptacles for Attachment Plugs, and Plugs.—Harvey Hubbell, Inc., Bridgeport, Conn.

"Hubbell" 10 amperes, 250 volts, catalog No. 6607.

Listed August 27, 1917.

Receptacles, Medium-Base.—Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins" metal shell.

Cleat-rosette receptacles for link fuses for use only in large mills in accordance with Rule 23*d* of National Electrical Code. 2 amperes, 125 volts, catalog Nos. BS-10 to BS-12 inclusive, BS-15, 24991, 50730.

Listed July 21, 1917.

Sockets, Medium-Base.—Pass & Seymour, Inc., Solvay, N. Y.

"P. & S." metal shell.

Electrolier key, catalog Nos. CM-S18, CM-S19, CM-S28, CM-S29.

Key, 660 watts, 250 volts, catalog Nos. CM-S20, CM-S30.

Keyless, catalog Nos. 7501, 7504, 7507, 7510, 7547, 7549, 7551, 7553, 59482-83, 59485, 59487, CM-S21, CM-S31.

Electrolier pull, catalog Nos. CM-S22, CM-S32; also catalog No. 1215 when installed with casing.

Listed September 1, 1917.

Key, catalog Nos. 1224, 1225.

Keyless, catalog No. 1227.

Pull, catalog No. 1228.

Listed October 8, 1917.

Sockets, Medium-Base.—Pass & Seymour, Inc., Solvay, N. Y.

"P. & S." porcelain shell. Key, catalog Nos. 1218, 1220, 1222.

Keyless catalog Nos. 1219, 1221, 1223.

Listed August 11, 1917.

Key, catalog No. 61317-Shurlok.

Composition weatherproof, keyless, 660 watts, 600 volts, catalog Nos. 43310-A Shurlok, 43310-B Shurlok.

Listed September 2, 1917.

Sockets, Mogul-Base.—General Electric Company, Schenectady, N. Y.

"G. E." metal shell.

Weatherproof, porcelain-lined.

Keyless, catalog Nos. GE900-01.

Listed September 12, 1917.

Switch Boxes, Supporting Strip for.—Ohio Distributing Company, 220 Lomax Place, Chicago, Ill.

"Ohio" sheet-steel strips formed into a U-shaped ribbed section having indents to engage mounting ears of standard switch and supplied with formed sheet-metal lath holders to secure ends of lath adjacent to switch boxes.

Listed October 12, 1917.

Switches, Automatic-Pressure-Operated Type.—General Electric Company, Schenectady, N. Y.

Automatic switch consisting of knife switch mechanically interconnected to valve and arranged for pressure control. 10 amperes, 250 volts, 20 amperes, 125 volts, type CR-2925.

Listed October 8, 1917.

Switches, Enclosed.—Detroit Fuse & Manufacturing Company, Walker Power Building, Walkerville, Ont.

Two-pole knife switches and cutout bases for standard plug or cartridge enclosed fuses. Enclosed in metal case and designed for manual operation without opening cases. "Square D."

0-200 amperes, all standard voltages, catalog Nos. 5211-E, 5251-X, 5252-54 inclusive, 5261-64 inclusive, 5311-E, 5341-44 inclusive, 5351-X, 5352-54 inclusive, 5361-64 inclusive, 5441-43 inclusive, 5452-53, 5461-63 inclusive.

0-30 amperes, 125 and 250 volts, catalog No. 56251.

Service switches and distributing centers, 0-30 amperes, 125-250 volts, catalog Nos. 2001-03 inclusive, 2011-13 inclusive, 2051-53 inclusive.

Combination service and meter-testing switch, 0-30 amperes, 125 volts, catalog No. 76211.

Listed October 10, 1917.

Switches, Enclosed.—Detroit Fuse & Manufacturing Company, Detroit, Mich.

Two-pole knife switches and cutout bases for standard plug or cartridge enclosed fuses. Enclosed in metal case and designed for manual operation without opening cases. "Square D."

0-30 amperes, 125 and 250 volts catalog No. 56251.

Combination service and meter-testing switch, 0-30 amperes, 125 volts, catalog No. 76211.

Listed October 11, 1917.

Switches, Fixture.—Pass & Seymour, Inc., Solvay, N. Y.

"P. & S." Single-pole. Pull. 5 amperes, 250 volts, 10 amperes, 125 volts, with brass canopy for use with chain or flexible cord pendants, catalog No. 1213.

Listed September 21, 1917.

Switches, Knife.—Connecticut Electric Manufacturing Company, Bridgeport, Conn.

"C. E. M. Co." 30 amperes, 125 volts, catalog Nos. 1500, 01500.

Listed September 6, 1917.

Switches, Knife.—T. Helske, 615 Howard Street, San Francisco, Cal.

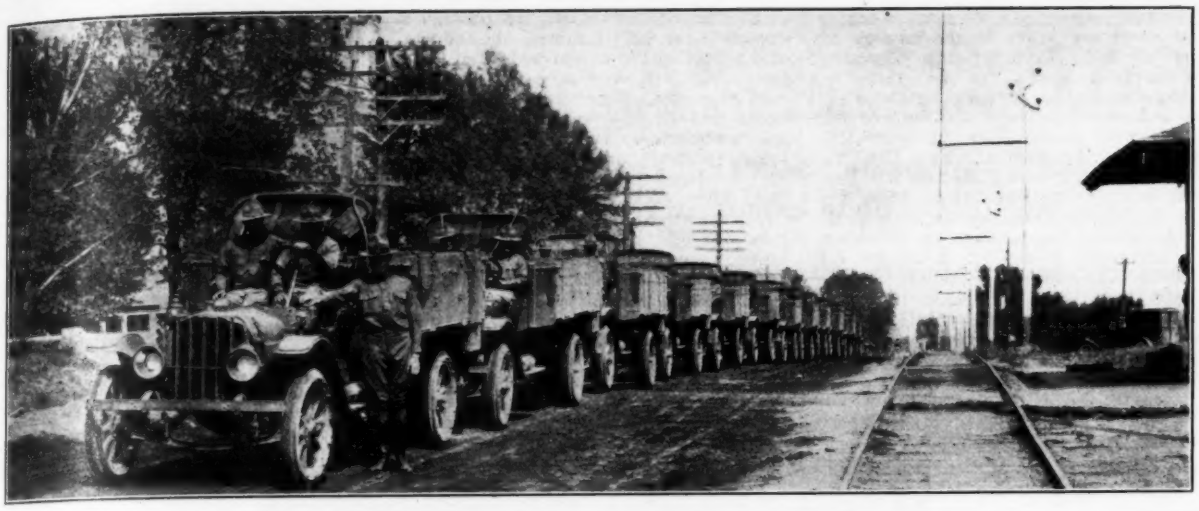
Service switch, mounted in metal cutout box and operated by opening and closing door of box, 30 amperes, 125 volts.

Listed October 26, 1917.

Switches, Knife.—Batavia Switchboard Company, Batavia, N. Y.

"Batavia" 30 to 200 amperes, 250 volts, front-connected. Type C.

Listed September 15, 1917.



Men in Government Service

H. M. Byllesby Accepts Appointment As Major in Aviation—Other Prominent Men Join Colors

JOHN HUNTER, chief engineer for the Union Electric Light & Power Company, St. Louis, Mo., has been appointed by the Government to aid in directing the construction of the American marine fleet, with especial charge of shipbuilding operations on the Passaic River in New Jersey.

CUTLER-HAMMER MANUFACTURING COMPANY, Milwaukee, Wis., since January 1 has given more than 200 men for practically every branch of Government service, of which number 150 were volunteers. In its C-H Messenger, dated November 15, (which little publication is sent to the boys in service regularly, keeping them in touch with C-H doings), mention is made of some who hold commissions, among whom is F. R. Bacon, being major; Harry E. Bradley, captain, both being located at the Fort Sheridan Officers' Camp; Tom Towle, second lieutenant at Fort Sheridan Officers' Camp, and Marvey C. Mittendorf, at Washington, D. C., busy at the Bureau of Naval Operations. Robert A. Tibbetts, who has been a member of the company's Boston office since June, 1912, was called in the first draft September 21, and September 23 left for Camp Devens, Ayer, Mass. Before departing he was tendered a dinner party by E. T. Foote, manager, and presented with a soldier's Gillette safety razor kit. Arnold Spiering and Chester Cook, of the company's cost department, report enjoying Army life at Camp Custer. Charley Barr, of the repair department, is now at Camp Custer, an acting first sergeant of Company 2, 26th Battalion, 160th Depot Brigade. Walter Bitker, who has a twin brother, left September 22 for Battle Creek, Mich., being drafted in County Division No. 1. John R. Bartlett, of the Boston office, September 19 went to Washington, D. C., to enter Government service in the Civil Service Commission, Post Office Division.

ROLL OF HONOR.

The electrical industry, perhaps to a greater extent than any other industry, has answered the call of the Nation for men. As this is a war of engineers, naturally the technically trained men in the electrical industry have been in great demand and they have responded with splendid patriotism. Many of the large utility and industrial corporations have assigned men for Government service aside from those who have voluntarily entered or been called for service.

THE ELECTRICAL REVIEW will *welcome news concerning men who have entered the service or who are engaged in any patriotic duties.*

MINNEAPOLIS STEEL & MACHINERY COMPANY, Minneapolis, Minn., has furnished its quota of volunteers for men in Government service and in its November Bulletin lists the names of 97 employees on its roll of honor, which list is incomplete, as many of the boys left without announcing their departure. One of its young men, Byron Van Ness, whom James L. Record, president of the company, sent to France as an ambulance driver, and who will enlist as infantryman in the U. S. Army when released from the ambulance corps, has written very interesting letters to his mother, the first of which was reprinted in the June and July issues of the Bulletin, and the second of which is reprinted in the November issue, with seven photographs, showing ambulances in France, an anti-air craft gun, etc.

CHICAGO SECTION OF ELECTRIC VEHICLE ASSOCIATION reports four of its members having answered the call to the colors, who are C. H. Kinney, C. F. Liable, P. Junkersfeld and Howard Marsh.

MAJ. JOHN C. HAYS, formerly president of the Mount Whitney Power & Electric Company in the San Joaquin Valley, California, has arrived at Camp Lewis in the State of Washington and will have charge of the newly created utilities department at that camp.

PUBLIC UTILITIES' employees at Hot Springs, Ark., who answered the first call for volunteers are James Dugan, clerk, and James Fuiton, motorman, now corporals; cashier Jesse Gilliam and attorney Hartley Wootton, now lieutenants, and commercial representative H. F. Dyer, now a yeoman.

VAUGHAN E. MONTGOMERY, formerly in the sales department of the Cincinnati office of Crocker Bros., is now at Chillicothe, Ohio, with the machine gun company of the 330th Regiment. He was recently promoted from Private to Sergeant and was also appointed special instructor in English for his Company.

DUQUESNE LIGHT COMPANY SECTION OF THE N. E. L. A., Pittsburgh, Pa., in its November issue of Light Company News makes the following additions to its roll of honor: J. E. Bolden, of the South Side department, W. Ross, of 13th Street Public Service, Rufus Johnston, William Ryan and Arthur Young, of Rankin Public Service, all in the National Army, and R. J. Miller, of the Laboratory, in U. S. Army.

FRED W. WERTH, treasurer of the Postal Telegraph-Cable Company of Texas, Dallas, Tex., has resigned to enter the Navy at San Francisco as yeoman. Mr. Werth is 25 years of age. He entered the employ of this company as check boy in 1907, advanced to clerkship in the auditor's office in 1910, and was elected secretary and treasurer in 1915. During his employment in the auditor's office he studied law and was admitted to the Texas bar in 1914.

JOSEPH ERMENVILLE, 24 years old, who has spent six years in the employ of the Garfield Manufacturing Company of Garfield, N. J., the past three of which in charge of correspondence in its service department, has entered the government service with the 309th Machine Gun Battalion at Camp Dix.

A. E. PIERCE, vice-president and general manager at Eau Claire, Wis., for the Wisconsin-Minnesota Light & Power Company, has accepted a captaincy of engineers in the U. S. Army for service in France. His duties at Eau Claire have been taken over by P. D. Klein, for some time general manager of the company's La Crosse properties, who will divide his time between the two points.

CHARLES G. DUBOIS, comptroller of the American Telephone & Telegraph Company, for the next six months will work for the American Red Cross, systematizing that society's accounting methods. He will serve the Red Cross as comptroller, which position was created for him as soon as his services were obtained. During his absence, H. Blair-Smith, general auditor of the American Telephone & Telegraph Company, will serve as acting comptroller. Chief Accountant E. V. Cox has been appointed general auditor of the company and Assistant Chief Accountant C. A. Heiss has been promoted to chief accountant. In selecting Mr. DuBois for the office of comptroller of the Red Cross, the Bell System is complimented upon the efficiency of its organization and its individual workers. The Government, or an organization working with the Government on war matters, when desiring some one capable of handling a particularly difficult task in an efficient and comprehensive manner, repeatedly turns to the Bell System for the right person to fill such a place. Henry P. Davison, chairman of the War Council of the Red Cross, succeeded in securing Mr. DuBois' services through Theodore N. Vail, who is serving the Government on the Council of National Defense. In his new position Mr. DuBois will follow the methods which enabled him to put the accounting system of the Bell companies in such good shape that the Interstate Commerce Commission accepted them, with minor changes, for use when the telephone companies made their regular reports to the Federal body. Mr. DuBois is said to be an accountant with imagination and figures are not merely figures to him. When handling figures relating to various branches of work, he pictures the actual work, seeing the human and the physical side first and the monetary cost afterwards. He will try to paint the picture of the activities of the Red Cross through his figures in the same manner that he visualizes the efforts of workers in the nation-wide Bell System. He will see surgeons bending over wounded soldiers on the field of battle and in base hospitals. He will see ambulances rushing over shell-swept roads to gather up injured and the bandages and surgical dressings and other equipment which the Red Cross procures and distributes where most needed. He will also find the relation between all parts of the organization, the collection of raw materials, the produciton of the finished articles and their distribution, and will translate all this into a statistical picture, which the executives of the Red Cross War Council can use in directing the further expenditure of the millions of dollars placed in their hands. He is known by almost every one in the Bell System, who congratulate him upon his selection for the comptrollership of the Red Cross.

Major H. M. Byllesby.

H. M. BYLLESBY, at the request of the War Department, has accepted a commission as major in the Aviation Section of the United States Signal Corps. He will be executive officer of the Personnel Section in charge of recruiting the large number of fliers and mechanics needed for aviation service. His headquarters will be in Washington, but as his duties will require traveling he expects to visit Chicago frequently. Although Mr. Byllesby has been active in civilian war work in various capacities the summons from the government was unexpected. He promptly accepted when the urgency of the situation was explained by the War Department. As an organizer and presiding officer of patriotic meetings in Chicago, as a speaker in the Liberty Loan campaigns in Illinois and Wisconsin, and as a member of the executive committee of the Chicago Chapter of the Red Cross, Mr. Byllesby's patriotic efforts are well known. He is also chairman of the Chicago Branch of the National Security League; member of the executive committee and one of the organizers of the Universal Military Training League; chairman of the Allied Committee for recruiting in Chicago; a member of a committee of the National Defense Council and an active worker for the Navy League. Mr. Byllesby has been closely indentified with the development of the electrical industry from its inception in the United States, and was associated with Thomas A. Edison and George Westinghouse before going into business independently. As an engineer he has participated both in the perfection and the manufacture of electrical apparatus and the construction of hydroelectric and steam power plants. Since January 1902 Mr. Byllesby has been the president of the Company bearing his name, which has been prominent in the financing, designing, construction, operation and management of electric light and power, gas and street railway properties, these properties now serving about 2,000,000 people in upwards of 50 communities in sixteen states.

CAPT. DONALD B. ROBINSON of the U. S. S. C. R., commanding officer of Company B of the 309th Field Signal Battalion, 84th Division, Camp Zachary Taylor, Louisville, Ky., recently received notice of his promotion from the rank of first lieutenant to a captaincy. He is a son of George W. Robinson, president of the Tri-States Telephone & Telegraph Company. He was born in Kansas City in 1891 and educated in the schools of Kansas City, St. Louis and St. Paul. After graduation he entered the Rensselaer Polytechnic Institute at Troy, N. Y., where he spent three years in the study of electrical engineering. During vacation periods he worked for the Tri-State Telephone & Telegraph Company. After leaving Rensselaer in 1915 he spent a year in the engineering department of the Tri-State Telephone & Telegraph Company at St. Paul and then was engaged in construction of buildings for new automatic systems in Minneapolis and St. Paul. In 1916 he went to Windom, Minn., as district manager for the Tri-State company and early last June left to recruit for signal service in St. Paul and adjoining territory, having been commissioned first lieutenant. When training camp opened at Fort Leavenworth in July he was sent there, and his work was so satisfactory that he was recommended for a captaincy.

Changes and Activities of Electrical Men

Theodore N. Vail Heads Red Cross Christmas Committee—Thomas N. McCarter Appointed Head of War Board of Electric Railways

GARRETT POOLE, Butler, N. J., has been appointed assistant engineer at the municipal light and power plant.

WALTER G. PARKER, who is manager of the Penobscot Bay Electric Company, Bucksport, Me., has also been made general manager of the Waterville, Fairfield & Oakland Railway, of Waterville, Me.

JOHN HUNTER, chief engineer of the Union Electric Company, St. Louis, Mo., has received a temporary leave of absence to depart for the East as a district superintendent for the United States Emergency Fleet.

C. JONES, of the transformer engineering department of the General Electric Company, Pittsfield, Massachusetts, recently made a trip to the Pacific Coast, visiting the district offices of the company at Los Angeles, San Francisco, Portland and Seattle.

W. C. WEBSTER, who has been secretary and general manager and director of the Nichols Copper Company, 25 Broad Street, New York City, for several years, has resigned and withdrawn from the situation. Mr. Webster expects to take a rest before assuming further duties.

L. O. VESER has accepted a position on the engineering staff of the Electric Bond & Share Company, 71 Broadway, N. Y. For the last two and one-half years Mr. Veser has been electrical superintendent of the Aluminum Company of America and the St. Lawrence River Power Company at Massina, N. Y.

S. B. IRELAN, who was vice-president and general manager of the City Light & Traction Company, Sedalia, Mo., has been made vice-president and general manager of the Montgomery Light & Water Power Company at Montgomery, Ala. He formerly was manager of the Bartlesville Interurban Railway, Bartlesville, Okla. These three properties are owned by the Cities Service Company.

P. D. KLEIN, who for some time has been general manager of the Wisconsin-Minnesota Light & Power Company's properties at La Crosse, Wis., has taken over the duties of A. E. Pierce, vice-president and general manager of the company at Eau Claire. Mr. Klein's headquarters will be in Eau Claire, but he expects to spend two days of each week in La Crosse.

PROF. JOHN FAY WILSON is now associate professor of Electrical Engineering at the University of Southern California in Los Angeles. For five years he occupied a similar position at the University of Michigan and during the last year at Queens University, Kingston, Canada. He is the author of "Essentials of Electrical Engineering" and "Dynamo Laboratory Outlines."

W. B. MISER, manager of the Drumright division of the Oklahoma Gas & Electric Company, has been elected president of the Drumright Rotary Club.

G. W. WESLEY has joined forces with the Simplex Automobile Company, New Brunswick, N. J. Mr. Wesley formerly was vice president of the General Vehicle Company, Long Island City, N. Y.

L. P. BAURHENN, superintendent of the Hudson division of the Public Service Railway, Newark, N. J., has been appointed to a similar position on the Essex division, with headquarters at Newark.

PERCY E. WRIGHT, consulting mechanical engineer of Seattle, Wash., has taken the management of the Jeffery Manufacturing Company, of Columbus, O., for the Northwest and opened offices in the L. C. Smith Building, Seattle.

CHARLES E. FIERS, for several years an electrician at Sioux Falls, S. D., has been made manager of Milbank Light & Power Company, at Milbank, S. D. Prior to going to Sioux Falls Mr. Fiers was superintendent of the electric light system at Grand Forks, N. D.

L. W. SHIRLEY, formerly general sales manager for the Link Belt Company at Chicago, Ill., is now located in Seattle, Wash., as secretary and manager of the Washington Corporation of the Link Belt Company, with plant and offices 574-576 First Avenue South.

A. ARNOLD BRAND, formerly electrical engineer in the Publicity Department of the National Carbon Company, Inc., Cleveland, Ohio, has left that company to enter the patent department of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa.

THOMAS N. MCCARTER, president of the Public Service Corporation of New Jersey, Newark, N. J., has been elected chairman of the recently-formed war board of the American Electric Railway Association. Daniel Willard, chairman of the Advisory Commission, Council of National Defense, was elected an ex-officio member of the board.

J. F. MCGUIRE, manager of the Minot (N. D.) division of the Northern States Power Company, has been appointed on the committee in charge of the United States Signal Service Corps School, that was opened at Minot November 15.

D. C. DURLAND, who for 23 years has been connected with the General Electric Company, has been elected president of the Mitchell Automobile Company, succeeding Otis C. Friend, resigned. Mr. Durland takes office December 1. R. C. Rueschaw, who was sales manager and director of the Reo company, has been made vice president of the Mitchell company.

A. J. EAVES, assistant electrical engineer of the Postal Telegraph-Cable Company, New York City, has resigned after 15 years' service, to join the engineering staff of the Telegraph Development Department of the Western Electric Company, with headquarters at New York.

A. S. HALLS was elected president of the Oregon Association of Electrical Contractors & Dealers at its recent meeting. The members feel the organization is fortunate in securing such an able electrical engineer and contractor to lead the association for the coming year.

ALFRED SWEENEY has been made assistant general manager of the Cumberland County Power & Light Company, Portland, Me. Since his graduation from Pratt Institute, Brooklyn, N. Y., in 1904, he has filled a number of responsible positions with heat, light and power companies in the East, in various capacities.

F. C. POTVIN, secretary of the Northern Ohio Traction & Light Company, Akron, Ohio, has resigned to be succeeded by Charles Lahr, who has been with the company since its organization and for the last 11 years has been its auditor. James Sweeney, who has been connected with the accounting department of the company for 11 years, having been chief accountant for over five years, will be Lahr's successor as auditor. George Wehrle, for four years chief assistant to Sweeney, is now chief accountant.

THEODORE N. VAIL, president of the American Telephone & Telegraph Company, who has accepted the chairmanship of the Red Cross Christmas membership committee, hopes to start the drive for 10,000,000 new members with his own subscription. The object of the Christmas drive is to increase the membership of the Red Cross to 15,000,000, the roll now listing about 5,000,000 names. In enclosing his subscription to Admiral S. A. Staunton, chairman of the District of Columbia Chapter, Mr. Vail wrote that even 15,000,000 must start with "one" and he hoped his "one" would be the first subscription to the Christmas membership of the Red Cross.

Obituary.

FREDERICK W. COLE, inventor of various devices for fire alarm systems, died November 11, at his home, Newton, Mass., aged 60 years.

EUGENE B. GOODWIN, Millville, N. J., president of the Millville Gas and Millville Electric Light companies, Millville, died November 16, at his home, aged 71 years. He is survived by his widow, a daughter, and three sons.

Current Electrical News

WEEKLY RECORD OF CONSTRUCTION ACTIVITIES

EASTERN STATES.

BRIDGEPORT, CONN. — Fairbanks Storage Battery Company, Inc., 438 Atlantic street, Stamford, has awarded a contract for the construction of a new local storage battery station, one-story, about 40x120 feet, to cost about $20,000. W. A. Smith & Son, 188 Cannon street, Bridgeport, are the contractors.

BUFFALO, N. Y.—Farrar & Trefts, 67 Perry street, have had plans prepared for the construction of a one-story power house at their plant. The structure will be of brick, about 30x130 feet. The Ferguson Steel & Iron Company, 1399 Bailey street, Buffalo, is the architect.

CLYMER, N. Y.—Clymer Power Corporation has been granted permission to operate an electric plant here, which was granted on the petition submitted by the company to the Public Service Commission at Albany. The permit is subject to such restrictions as stipulated in the franchises granted by Clymer.

JORDAN, N. Y. — Jordan Electric Light & Power Company is planning for extensions and improvements in its power system.

LONG ISLAND CITY, N. Y.—Enderlin Electric Welding Company, Front street, has filed notice of an increase in its capitalization from $1000 to $10,000 to provide for expansion.

NEW YORK, N. Y. — Car Locater Light Company has been incorporated with a capital of $10,000, to make electric lamps, locaters and electric devices. R. M. and P. Loewenthal and C. H. Low, 30 East 42nd street, are the incorporators.

NEW YORK, N. Y. — Cosmopolitan Gas & Electric Supply Company has incorporated with a capital of $10,000. D. and S. Swartz and W. Shlessinger, 280 Bowery, New York City, are the incorporators.

NEW YORK, N. Y.—Dorrite Insulation Company has incorporated with a capital of $200,000. The incorporators are H. A. Dorr, C. O. Hall and R. D. Adams, 176 Broadway, New York City.

NEW YORK, N. Y.—Otto Heineman Phone Supply Company, 25 West Forty-fifth street, has awarded a contract for the construction of a two-story addition to its plant at Putnam, Conn. The structure will be about 40x100 feet.

NIAGARA FALLS, N. Y.—Hudrofats, Inc., 98 Delaware avenue, has awarded a contract to John W. Cowper, Fidelity Building, Buffalo, for the construction of a one-story power house, which in connection with another shop building will cost $20,000.

PORT EWEN, N. Y.—Cali Electric Light & Power Company has filed notice of dissolution of the company.

ROCHESTER, N. Y.—Rochester Light & Power Company has awarded a contract to the Turner Construction Company, 244 Madison avenue, New York, for the construction of an addition to its plant to cost about $70,000.

WALDEN, N. Y. — Walkill Valley Electric Light & Power Company has filed notice of an increase in its capitalization from $16,000 to $30,000 for expansion.

BORDENTOWN, N. J.—City Council has completed plans for extensive improvements in its street-lighting system. Increased candlepower units will be used, and larger lights will be installed in the business section of the city.

HADDONFIELD, N. J. — Borough Council is considering the erection of a municipal electric-lighting plant on a site on Evans Pond. Work has just been completed on the construction of a concrete dam, spillway and bulkhead, which makes this body of water available for power purposes.

JERSEY CITY, N. J. — American Sugar Refining Company has taken out a permit for alterations and improvements in its power house at 153 Washington street.

NEWARK, N. J.—Rubber & Celluloid Products Company, Hamburg place, is having plans prepared for alterations and improvements in its power house.

NEWARK, N. J. — United Color & Pigment Company is having plans prepared for the construction of a one-story brick power house at its plant at Evergreen avenue and the Pennsylvania Railroad. The structure is estimated to cost about $10,500. Percy B. Taylor, Essex Building, Newark, is engineer.

RED BANK, N. J.—Roberts Safety Water Tube Boiler Company is having plans prepared for extensions and alterations in its power house at its works. The H. D. Best Company, 52 Vanderbilt avenue, New York, is architect.

WESTFIELD, N. J.—Park Commission is planning for the immediate installation of an electric-lighting system through the Lake Park. Ornamental lighting standards will be used.

ALTOONA, PA.—Ground has been broken for an immense plant in which the Pennsylvania Railroad Company will mix all its own lubricating oils, greases and signal oils for the lines east of Pittsburgh and Erie. Thirty-one steel storage tanks will be constructed, ranging in capacity from 1000 to 125,000 gallons each. The plant will be electrically operated and will take but a small force of men to operate.

ALTOONA, PA. — Altoona & Logan Valley Electric Railway Company has completed the construction of its new line at East Juniata as far as Fourteenth street, and is planning to inaugurate operations at an early date.

EASTON, PA.—Pennsylvania Utilities Company has commenced the installation of new coal storage equipment at its Dock street plant. The company has completed the installation of ash handling equipment and inaugurated operations, and it is expected that a reduction of 15 per cent of the cost of handling the ashes will be effected. Arrangements are being perfected for a trolley connection from the plant to the coal storage and ash dumping grounds. This would greatly facilitate the handling of coal and ashes, as the company has heretofore been employing motor trucks for this purpose.

PHILADELPHIA, PA.—F. A. Poth & Sons, Thirty-first and Jefferson streets, have had plans prepared for the construction of a one-story power house, about 44x50 feet, which, with equipment, is estimated to cost about $100,000. Contract has been awarded to Charles H. Casper, 925 Chestnut street, Philadelphia.

PHILADELPHIA, PA. — City has awarded a contract to the Standard Construction Company, 1713 Sansom street, for the erection of a one-story brick power house at Vintage and University avenues to cost $238,600.

PHILADELPHIA, PA. — Francis Thole, Fifty-eighth and Hoffman avenues, has taken out a permit for the construction of a power house addition to his plant.

PHILADELPHIA, PA. — Bell Telephone Company, 406 Market street, has had plans prepared for alterations and improvements in its exchange plant. The company is also planning for immediate improvements in its Hazleton plant to provide for increased capacity.

PHILADELPHIA, PA.—United States Government, Bureau of Yards & Docks, has awarded a contract to the Commercial Engineering Company, 1527 Sansom street, Philadelphia, for the installation of an electric system at the local navy yards, to cost about $25,000. F. R. Harris is chief.

PITTSBURGH, PA.—Pittsburgh Steel Products Company, Frick Annex Building, has commenced the erection of a one-story sub-station, about 32x83 feet, at Allenport. The structure is estimated to cost $15,000. The Wilson Construction Company, Fulton Building, Pittsburgh, is the contractor.

READING, PA.—Metropolitan Edison Company has commenced the construction of a large addition at its West Reading plant which will double the capacity. Immediately upon completion the company is planning to install a 25,000-kilowatt turbine and two 1000-horsepower boilers.

WILKES-BARRE, PA. — Lehigh & Wilkes-Barre Coal Company has commenced the construction of a power house at its Green Mountain colliery for the operation of the works.

DOVER, DEL.—Beaver River Power & Light Company has incorporated with a capital of $400,000, to supply electricity for lighting and power purposes. The incorporators are M. M. Clancy, C. L. Rimlinger, of Wilmington, and C. E. Egner, of Elkton, Md.

WILMINGTON, DEL.—Beaver Power & Light Company has incorporated with a capital of $400,000, to supply electricity for heating, lighting and power purposes. M. M. Clancy, of Wilmington, is one of the incorporators.

WILMINGTON, DEL. — Montgomery Transit & Light Company has been incorporated with a capital of $1,000,000, to construct and operate light plants and railways. K. E. Longfield, of Wilmington, is an incorporator of the company.

BALTIMORE, MD.—Poole Engineering Company has awarded a contract to the H. D. Watts Company, Garrett Building, Baltimore, for the construction of a two-story reinforced-concrete and brick electric sub-station, about 35x55 feet.

BALTIMORE, MD. — Bartlett-Hayward Company, Scott and McHenry streets, has awarded a contract for the construction of a one-story brick power house, about 44x46 feet. Morrow Brothers, Fidelity Building, Baltimore, are the contractors.

BALTIMORE, MD. — Consolidated Gas, Electric Light & Power Company, Lexington street, is having plans prepared for a three-story brick and steel distributing station on Custom House avenue, about 65x90 feet.

SINGERLY, MD.—T. W. Bacchus has awarded a contract for the construction of a one-story power house at his plant. A. M. Stricklin & Son, Elkton, Md., are the contractors.

WASHINGTON, D. C.—Potomac Electric Power Company, Fourteenth and C streets, N. W., is having plans prepared for the construction of an addition to its plant to cost about $27,000. Milburn, Heister & Company, Union Savings Bank Building, Washington, are the architects.

GLENLYN, VA.—Appalachian Power Company of Bluefield, W. Va., has commenced the construction of a large steam generating station on the New River, which will have an initial capacity of 20,000 kilowatts, to be increased to 60,000 kilowatts. The new plant will supplement the company's hydro-electric plants in supplying power to the Pocahontas coal field and other power users in the southern part of Virginia and West Virginia. C. W. Hancock & Sons, Lynchburg, Va., are the contractors.

NORFOLK, VA.—Virginia Railway & Power Company has awarded a contract to J. H. Pierce, Law Building, Norfolk, for the construction of a one-story brick and concrete sub-station, about 20x25 feet.

PETERSBURG, VA.—Petersburg & Appomattox Railway Company is making rapid progress in the construction of its double track electric line to Camp Lee, near Petersburg.

MORGANTOWN, W. VA.—It has been decided to install a practically new Westinghouse 1250-kilowatt turbine at Morgantown power house of West Virginia Traction & Electric Company. Arrangements for the purchase of power from the Monongahela Valley Traction Company have been definitely completed, and work is well advanced on the latter's transmission line which it is constructing between Fairmont and Morgantown.

ST. ALBANS, W. VA.—St. Albans Electric Manufacturing & Supply Company, of this city, has been incorporated with a capital stock of $50,000 by local capitalists, including H. W. Gonia, C. A. Zerkle, and others, for the purpose of operating an electric plant.

WHEELING, W. VA.—Morgantown Division of the West Virginia Traction & Electric Company is making rapid progress in the installation of new stoker equipment at its power house, and the company is planning for the immediate installation of a new 1250-kilowatt turbine of Westinghouse make.

BURLINGTON, N. C. — Alamance Railway Company has been chartered with a capital of $60,000, to build and operate electric, steam or other railways in Alamance, Durham, Guilford, Orange and other adjacent counties, and to connect the towns of Burlington, Carolina, Glencoe, Graham, Haw River, Hopedale. It can also operate street railways. George W. Hatch and F. E. Cox are incorporators.

COLUMBIA, S. C.—City is planning for the immediate installation of new equipment at the waterworks to increase the capacity, including two G. P. M. centrifugal pumps with capacity of 5,000,000 gallons daily; one 2100 G. P. M. centrifugal pump with capacity 3,000,000 gallons daily; 250-horsepower electric motor of 550 voltage and two 400-horsepower electric motors of 3300 voltage, and auxiliary apparatus. F. C. Wyse is engineer and superintendent.

DECATUR, GA.—City is planning for the construction of a large electric station to be used for the pumping of water to consumers.

NEW PORT RICHEY, FLA.—Richey Construction Corporation has bought an electric lighting plant and will enlarge same to supply lights to the central part of the city. Clyde F. Burns, general manager.

NORTH CENTRAL STATES.

AKRON, OHIO.—Work on the new county infirmary includes a new power plant, which will be built by the H. P. Moran Company, general contractor, for $6,800, including wiring and other electrical equipment.

CINCINNATI, OHIO.—Columbus Gas & Electric Company has acquired the power plant and distribution lines of Loveland, Ohio, for about $40,000, and the town will hereafter be supplied with current by the Union Gas & Electric Company. For the present the Loveland plant is being operated as a separate unit, as formerly, but the company plans eventually to supply the town from its own lines.

CINCINNATI, OHIO.—National Lead Company is preparing to construct a power plant in connection with its local factory, at a cost of about $45,000.

CINCINNATI, OHIO.—Union Gas & Electric Company is making preparations for the discontinuance of its plant at Canal and Plum streets as a power station, and in that connection is installing high-tension connections between it and the new river power plant, with the intention of using the Canal plant only as a distribution station. Conduits for this purpose are being installed.

CINCINNATI, OHIO.—Union Gas & Electric Company, of Cincinnati, has been awarded the several contracts for the installation of boulevard lights on the downtown streets. The system is to be a unit, but it was thought best to let the work in several sections. The company will install single-light lamps throughout the business district, and will furnish current for their maintenance at a uniform price of $60 a year.

DATES AHEAD.

Philadelphia Section of Association of Iron and Steel Electrical Engineers will hold a meeting December 1. O. H. Eschholz, of the Westinghouse Electric & Manufacturing Company will read a paper on "Some Recent Investigations in Arc Welding."

American Society of Mechanical Engineers. Annual meeting, New York City, December 4-7. Secretary, Calvin W. Rice, 29 West 39th Street, New York City.

American Institute of Consulting Engineers, Inc. Annual meeting, January 14. Secretary, F. A. Molitor, 35 Nassau Street, New York City.

Electrical Contractors' Association of State of Missouri. Annual convention, January 19. Secretary, A. J. Burns, 318 West Tenth Street, Kansas City, Mo.

Minnesota Electrical Contractors' Association. Annual convention, Minneapolis, Minn., January 20. Secretary, G. M. Jones, 112 South Seventh Street, Minneapolis.

Western Association of Electrical Inspectors. Annual meeting, Memphis, Tenn., January 29-30-31. Secretary, W. S. Boyd, 175 West Jackson Blvd., Chicago, Ill.

Illinois Electrical Contractors' Association. Semi-annual convention, Chicago, February, 1918. Secretary-Treasurer, L. B. Van Nuys, 238 South Jefferson Avenue, Peoria, Ill.

DEGRAFF, OHIO.—At the recent election voters in the town approved a proposition for the sale of the municipal electric plant, coupled with the plan of securing current for city and domestic purposes from a new company, presumably the purchaser of the city plant. The municipal plant proved to be an unprofitable venture, which was the reason for the vote for its sale.

HAMILTON, OHIO.—Engineers Mead & Seaston have prepared estimates for enlarging the electric lighting plant. Two new boilers should be installed, the ash and coal handling installation changed, new gas grates installed under present boilers and a new steam generator of at least 1,250 kilovolts should be added immediately. It is recommended that the substitution of Mazda type of lamps for arc light will result in a saving.

CHARDON, OHIO.—Bonds of $25,000 have been voted for an electric lighting plant. The old machinery used for 20 years is worn out. Engineer E. C. Thompson has prepared plans.

HAMILTON, OHIO.—Ohio Gas & Electric Company is planning to construct a large substation near Hamilton, having bought land for this purpose. Competition with the municipal plant in Hamilton would result, and the city is consequently opposed to the construction of the proposed substation. Denial of franchise rights is relied upon by the city to keep the company from furnishing current in Hamilton.

CROMWELL, IND.—M. Moore & Company's electric light plant and sawmill were destroyed by fire recently; loss $7,000.

MARTINSVILLE, IND.—Martinsville Gas & Electric Company has increased its capital from $150,000 to $200,000.

SHERIDAN, ILL.—Sheridan Electric Light & Power Company has filed an application with the state utilities commission for a certificate of necessity and convenience to operate at Sheridan, La Salle county. The company also asks the right to dispose of $3,000 in bonds.

VIENNA, ILL.—J. J. Oelrich has petitioned council for franchise to establish a light and power plant.

GRAND RAPIDS, MICH.—Consumers Power Company is making an addition to its power plant here, installing one 10,000-kilowatt turbine and two 2,365-horsepower Stirling boilers, similar to those in use at the Delray Station of the Detroit Edison Company. The installation will probably be completed by December 1.

WAYLAND, MICH.—C. H. Burch has ceased operating his private electric light plant here, owing to coal shortage. Business men have formed the Citizens' Light Company, which is now being operated. Of the $5,000 necessary $3,000 has been subscribed. C. B. Mason is president and Dr. E. O. Hanson, vice president of the corporation.

WHITEHALL, MICH.—White River Lighting & Power Company is now furnishing Whitehall with 24-hour electric service.

APPLETON, WIS.—Wisconsin Traction, Light, Heat & Power Company's station addition at Brighton Beach is completed and nearly doubles the size of the station.

EDGERTON, MINN.—Northern States Power Company has closed a 10-year contract for street lighting and city pumping here. If present plans of the company materialize Pipestone will in the future be furnished with electric light and power, either by Minnesota Falls or St. Croix.

FT. MADISON, IA.—A movement for the installation of a real boulevard arc system on Second street is under way. The plan is to induce the Ft. Madison Electric Company to install the lights and to maintain them. The merchants or association will merely rent them and pay for the service at a low rate.

RED OAK, IA.—Plans are being prepared for the water works, sewer and gas mains. Bids will be received early in spring. Owner, McGregor Subdivision Company, Cedar Rapids State Bank Building, Cedar Rapids; engineer, H. R. Greene, Second street and First avenue E, Cedar Rapids.

GRANT CITY, MO.—Grant City Electric Company was sold by W. C. Childers to the Maryville Electric Light & Power Company, consideration $16,500. J. C. Helmers, the manager of the Maryville company, who consummated the deal, has taken possession of the plant and G. Hartman has been placed in charge. It is the intention of the new company to bring the current from Maryville just as soon as the right of way can be secured and the line built, which will probably take a year.

JOPLIN, MO.—Empire District Electric Company is planning for the installation of a turbine to increase its total steam generating capacity to 55,000 kilowatts. The improvement will cost approximately $275,000.

KANSAS CITY, MO.—Improvements are being made at the plant of the Kansas City Light & Power Company which will give temporary relief by January 1. Experts were busy recently installing a new 3500-kilowatt generator at one of the substations. The government has released the blowers for the 9000-kilowatt generating unit, which will be in use by the first of the year.

OZARK, MO.—Pursuant to a decree of the Circuit Court the Ozark electric light plant, known as the Water Power Light Company, was sold at a receiver's sale recently. The property was bought by George T. Breazeale to protect the mortgagees, Fred Griffith, W. E. Keltner and Mr. Breazeale. The plant will be operated as usual until sold to other parties.

ST. JOSEPH, MO.—That the city of St. Joseph, with the expenditure of $31,000 could so improve its electric lighting plant that it would be able to take care of the white way of 247 standards, the lighting of the boulevards and parks and could add between 75 and 100 lamps to the plant, was the statement made recently by Mayor Elliot Marshall. The boiler capacity of the lighting plant is 850 horsepower and engine capacity is only 350.

CALDWELL, KANS.—Resolution passed for an additional system of street lights.

EL DORADO, KANS.—Electric Supply Company has incorporated with a capital of $10,000.

EL DORADO, KANS.—E. B. Lawson interests have bought the El Dorado Electric & Refrigerating Company. The plant is to be enlarged.

EL DORADO, KANS.—Roy Wright, formerly of Cripple Creek, has opened an electric shop here.

ELLSWORTH, KANS.—Peoples Light & Ice Plant is planning a new building that will increase its capacity from 300 to 500 kilowatts.

KANSAS CITY, KANS.—Plans for issuing $200,000 worth of bonds to extend and improve the municipal light and water plants of Kansas City were discussed by officials of the city. The business of both plants is growing and earnings are not sufficient to pay for extensions.

BAYARD, NEB.—About $4,500 in bonds for ornamental street lightings has been voted.

GARRISON, N. D.—Residents here voted in favor of a white way. Posts having two clusters will be placed in business sections of the city. City council is arranging for issuance of bonds, to meet expenses.

SCRANTON, N. D.—Johnson Fuel Company, of Fairfax, S. D., which has invested heavily in a briqueting plant here for the consumption of lignite, plans for the establishment of a large electric power plant at the mine, to utilize waste in the briquetting process. Light and power will be supplied to Bowman, Marmarth, Rhame and Scranton.

SOUTH CENTRAL STATES.

CLINTON, KY.—Clinton Water & Light Company has been taken charge of by Hooper Alley, under a lease on the property. Mr. Alley formerly was located at Columbus, Ky., and later was superintendent for the Sutherland Construction Company, Kansas City, Mo.

FAIRFIELD, KY.—Fairfield Electric Company's light plant burned recently.

LOUISVILLE, KY.—Louisville Gas & Electric Company is planning for the construction of a reducing station, about 50x200 feet.

RIDGLEY, TENN.—Ridgely Light & Ice Company, recently incorporated, will spend $10,000 on electric light construction. Specifications include 2,000 lights.

COLUMBIA, ALA.—Houston Power Company has been organized to build a hydroelectric plant. H. F. Deal, president.

MARION, ALA.—Alabama Power Company is making preparations for installing a permanent plant on the site of the Marion Electric Company's plan, which was destroyed by fire recently.

VIDALIA, MISS.—Southern Railway & Light Company's plant at Natchez will shortly furnish 24-hour electrical service for lights, power, etc., to Vidalia.

ARDMORE, OKLA.—Consumers' Light & Power Company has been awarded the contract of furnishing light and power to the BeSaw Tire & Manufacturing Company. This contract amounts to more than $20,000.

BRISTOW, OKLA.—City council has taken its first step for taking over electric lighting plant of this city. The mayor appointed an engineer to appraise the plant and estimate what cost would be for putting plant in first-class condition.

BREMOND, TEX.—Bremond Electric Light Company is having plans made for the construction of an electric plant to replace the structure destroyed by fire.

CANADIAN, TEX.—Canadian Water, Light & Power Company will install a new engine and other equipment in its water works and electric light plant here.

DALLAS, TEX.—W. B. Head, representing the Dallas Power & Light Company, announces that plans are being prepared for improvements to the property of that company here to cost approximately $2,500,000. This work will be started in a very short time and will involve the expenditure of about $750,000 within the next few months. The total amount of $2,500,000 is to be expended within the next five days. Additional machinery will be installed in the power plant and the street railway system extended.

SAN MARCOS, TEX.—San Marcos Utilities Company will make improvements to its electric light and water works plant here to cost $20,000.

UVALDE, TEX.—Uvalde Electric Light Company will enlarge its plant and provide power for pumping water from shallow wells for irrigation purposes.

VICTORIA, TEX.—City council will soon begin the construction of a municipal electric light and power plant to cost $40,000.

Electrical Patents Issued November 6, 1917

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,245,151. Mounting for Circuit-Breakers. N. J. Conrad, assignor to Schweitzer & Conrad, Inc., Chicago, Ill. Details of insulating mounting for high-potential switches, fuses and circuit-breakers. (See cut.)

1,245,166. Method of Transmitting and Receiving High-Frequency Signal Impulses. F. K. Vreeland, assignor to Vreeland Apparatus Co., Inc., New York, N. Y. Wireless system employing continuous wave train of sustained oscillations.

1,245,177. Shade-Holder. J. Beiswanger, assignor to Gill Bros. Co., Steubenville, O. For socket attachment.

1,245,187. Inclosed Electric Fuse. L. B. Buchanan and F. N. Conant, assignors to Chase-Shawmut Co., Newburyport, Mass. Details of renewable structure.

1,245,192. Controlling Device for Moving Picture Machines. J. Chesler, assignor to New Jersey Patent Co., W. Orange, N. J. Motor circuit is broken when film breaks or runs out.

1,245,194. Motor-Control System. G. N. Crabbe, assignor to Otis Elevator Co., Jersey City, N. J. Arrangement of relay-operated reversing switches.

1,245,200. Pressure Regulator and Motor Cutout. E. E. Davis, assignor to Union Engine & Mfg. Co., Butler, Pa. Structure of pressure-operated.

1,245,218. Transmitter-Cell. F. Gottschalk, Hilton, N. J. Structure of microphone.

1,245,221. Rain-Alarm. F. H. Hahne, Chicago, Ill. Signal circuit is controlled by a member which is severed on moistening.

1,245,222. Regenerative Control System. A. J. Hall, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. For returning current to railway line under predetermined voltage conditions.

1,245,223. Control System. A. J. Hall, assignor to Westinghouse Electric & Mfg. Co. Modification of above.

1,245,233. Vapor-Heating System. L. P. Hynes, assignor to Railway Utility Co., Chicago, Ill. Car steam-heating system is electrothermostatically controlled.

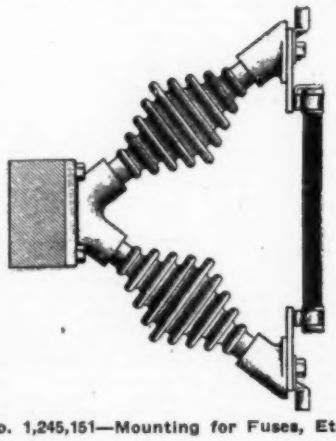
1,245,239. Alarm for Automobiles. A. H. Keller and G. D. Keller, assignors to said G. D. Keller, Philadelphia, Pa. Alarm against thieves has its circuit controlled by the exhaust.

1,245,241. Headlight Apparatus for Vehicles and Process for Dimming. J. H. Kendig, Pittsburgh, Pa. Light of a vehicle is dimmed by the illumination of an approaching vehicle.

1,245,266 and 1,245,267. Radiotelegraphy and Telephony Receiver. G. W. Pickard, assignor to Wireless Specialty Apparatus Co., Boston, Mass. Different arrangements employing an open-circuited coil as a detector.

1,245,288. Electrofluid-Pressure Brake. W. V. Turner, assignor to Westinghouse Air Brake Co., Wilmerding, Pa. Service application of air brakes is electrically controlled.

1,245,305. Receptacle. E. G. K. Anderson, assignor to Benjamin Electric Mfg. Co., Chicago, Ill. Structural details.



No. 1,245,151—Mounting for Fuses, Etc.

1,245, 321. Testing Circuit for Measured-Service Apparatus. J. Davidson, Jr., assignor to American Telephone & Telegraph Co. Manner of connecting a local test circuit with the cord circuit of a telephone system.

1,245,326. Candelabrum-Socket. E. H. Freeman, assignor to E. H. Freeman Electric Co., Trenton, N. J. Details of construction.

1,245,341. Service-Observing System. H. L. Hoffmann, assignor to American Telephone & Telegraph Co., Boston, Mass. For observing the service on a substation line.

1,245,356. Process of Interconverting High-Potential Polyphase and Direct Electric Currents and Transmitting Power. C. G. Koppitz, Youngstown, O. Commutation system employing arcs successively extinguished by gas blasts.

1,245,368. Spark-Plug Tester. W. M. Near, Shelby, Mich. Structure of auxiliary spark gap device.

1,245,371. Pawl and Ratchet Mechanism. La V. Noyes, assignor to Aermotor Co., Chicago, Ill. Electromagnetically operated structure.

1,245,374. Circuit-Maker for Oscillating Fans. G. Olson, assignor of ½ to W. M. McEwen, Chicago, Ill. Brush and collector ring structure.

1,245,383. Process of Treating Aluminous Ores. H. A. Richmond, assignor to General Abrasive Co., Inc., Niagara Falls, N. Y. Includes reduction of the metal by passing a heating current through a charge.

1,245,396. System of Control. N. W. Storer, assignor to Westinghouse Electric & Mfg. Co. Dynamic-braking system for locomotive employing substantially constant armature current.

1,245,397. Regenerative Control. N. W. Storer, assignor to Westinghouse Electric & Mfg. Co. Modification of No. 1,245,222.

1,245,398. System of Control. N. W. Storer, assignor to Westinghouse Electric & Mfg. Co. Combination of mechanical brake and series-parallel system of regenerative braking operating on substantially constant current.

1,245,402. System for Observing Telephone Service. J. F. Toomey, assignor to American Telephone & Telegraph Co. Modification of No. 1,245,341.

1,245,410. Controller for Power-Operated Mechanism. S. T. Walkup, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Controller for web-feeding mechanism of printing presses.

1,245,417. Electric Signaling System. E. W. Adams, assignor to Western Electric Co., New York, N. Y. For telephone systems; comprises a set of reeds giving a visual indication while vibrating.

1,245,422. Switching Device. C. F. Baldwin, deceased, F. D. Baldwin, administratrix, assignor to Western Electric Co. Electromagnetically operated switch for telephone systems.

1,245,428. Cover for Storage Batteries. W. L. Bliss, assignor to U. S. Light & Heat Corp., Niagara Falls, N. Y. Details of construction.

1,245,436. Automatic Telephone System. E. H. Clark, assignor to Western Electric Co. Arrangement of automatic connecting devices.

1,245,438. Telephone-Exchange System. H. P. Clausen, assignor to Western Electric Co. Automatic.

1,245,446. Radiotelephony. C. R. Englund, assignor to Western Electric Co. Operates by producing oscillations of carrier frequency and modulating them according to the signals to be sent.

1,245,454. Lantern-Slide-Exhibition Apparatus. E. L. Gilmore, assignor to Vitaslide Co., San Francisco, Cal. Has electric lamp and motor with an automatic switch to open the motor circuit after a given time.

1,245,459. Electric Heating Device. J. A. Heany, assignor to Patents Experiment Corp., New York, N. Y. Unit for irons, etc., employing alternating or pulsating currents. (See cut.)

1,245,464. Engine-Starting Device. J. Kane, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Relates to gearing of starting motor.

1,245,467. Display Signal. E. J. Kingsbury, Chicago, Ill. Relates to controller for bank of lamps for selecting the lamps to produce different characters.

1,245,478. Telephone-Exchange System. A. E. Lundell, assignor to Western Electric Co. Arrangement of key-controlled, relay-operated register.

1,245,481. Selector Switch. M. K. McGrath, assignor to Western Electric Co. Details of device for use in telephone system.

1,245,485. Electric Annunciating System. D. L. Martyn, North Yakima, Wash. Structure of contact apparatus.

1,245,490. Telephone-Service-Observing System. E. C. Molina, assignor to American Telephone & Telegraph Co. For observing the service on a group of substation lines.

1,245,505. Electrical Card-Tabulating Machine. J. Powers, assignor to Powers Accounting Machine Co., New York, N. Y. Electrical relation of the different mechanisms of an accounting machine.

1,245,507. Telegraph System. P. M. Rainey, assignor to Western Electric Co. Retransmitting apparatus for a relay system.

1,245,508. Electromechanical Gong. H. E. Reeve, New York, N. Y. Structural details.

1,245,517. Electric Musical Instrument. H. Scuterud, assignor to Choralcelo Co., Boston, Mass. Special structure of electromagnetically operated, sonorous body.

1,245,518. Electric Musical Instrument. M. L. Severy and G. B. Sinclair, assignors to Choralcelo Mfg. Co. Manner of selectively controlling electromagnets operating sonorous bodies.

1,245,523. Regenerative Braking System for Electric Motors. N. W. Storer, assignor to Westinghouse Electric & Mfg. Co. Modification of No. 1,245,398.

1,245,532. Controller for Motor-Driven Machines. F. P. Townsend and W. F. Lent, assignors to Cutler-Hammer Mfg. Co. Special coupling and brake arrangements for machine driven by a reversible motor.

1,245,536. Process for Atomizing Metals in a State of Fusion. F. C. Ucar, Madrid, Spain. Metal atomized by an arc is protected on a surface to form a metallic film.

1,245,551. Motor Controller. T. E. Barnum, assignor to Cutler-Hammer Mfg. Co. Comprises switch having starting and running positions and a dominant switch insuring proper sequential operation.

1,245,570. Push Button. W. J. Cooke, Charlotte, N. C. Structure of circuit-closer.

1,245,572. Automatic Time Switch. R. B. Craig, Calgary, and A. E. Cox, Okotoks, Alberta, Canada. Combination of dials controls setting of trip lever for switch.

1,245,575. Thermic Telephone. P. de Lange and R. A. Baron van Lynden, assignors to Naamlooze Vennootschap de Nederlandsche Thermotelephoon Maatschappij, Utrecht, Netherlands. Arrangement of a heat discharger for the heating conductor.

1,245,588. Recording Device for Meters. A. S. Hibbard, Chicago, Ill. Portable structure for registering readings of different meters on the record sheets.

1,245,589. Electric Signaling System for Railways. W. J. Higgins and C. J. Sheridan, Buffalo, N. Y. Block system.

1,245,592. Multiple Resetting-Fuse. J. W. Huebner, Milwaukee, Wis. Electromagnetically operated mechanism.

1,245,609. Electrical Measuring Apparatus. E. F. Northrup, assignor to Pyrolectric Instrument Co., Trenton, N. J. Temperature measuring device.

1,245,627. Circuit-Controller. A. Simon, assignor to Cutler-Hammer Mfg. Co. Proper sequential operation is secured in a motor controller.

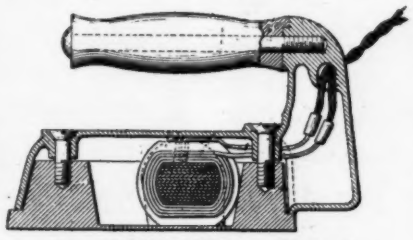
1,245,628. Spring Terminal for Binding Posts. C. H. Smith, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Structural details.

1,245,650. Automatic Telephone System. B. D. Willis, assignor to Automatic Electric Co., Chicago, Ill. Special control arrangements for automatic switch.

1,245,664. Generator Suspension. W. L. Bliss, assignor to U. S. Lt. & Heat Corp., Niagara Falls, N. Y. For a car-lighting generator.

1,245,665. Registering Mechanism. W. J. Bohan, St. Paul, Minn. Application of registering mechanism to a number of independently operable switches.

1,245,673. Electric Fitting. F. V. Burton, assignor to Bryant Electric Co., Bridgeport, Conn. A conduit fitting with an opening to permit fishing after the fitting has been installed.



No. 1,245,459—Flatiron Element.

1,245,699. Electric Lamp Socket. F. P. Gates, assignor to Arrow Electric Co., Hartford, Conn. Structure of push-button operated structure.

1,245,701. Short-Circuiting Device for Motors. M. I. Ginsburg, Baltimore, Md. Details of centrifugally operated contact structure.

1,245,702. Radiotelegraphy. E. Girardeau and J. Bethenod, Paris, France. Spark-gap structure.

1,245,707. Electric Vehicle - Signal Switch. V. M. Grummons, Fort Wayne, Ind. Mounting and insulation of switch contacts.

1,245,717. Electromagnetic Separator. C. T. Henderson, assignor to Cutler-Hammer Mfg. Co. For insertion in a pipe line.

1,245,748. Electrically Heated Bed-Lasting Machine. E. N. Lightfoot, assignor to Cutler-Hammer Mfg. Co. Manner of mounting the heating means.

1,245,748. Telephone-Exchange System. A. E. Lundell, assignor to Western Electric Co. Arrangement of connecting circuit and automatic switches.

1,245,753. Thermostat. M. M. Mason, Cleveland, O. Comprises an indicator and circuit closer operated by an expansible element.

1,245,757. Signal-Operating Mechanism. M. Merkel, Celestine, Ind. Burglar alarm having circuit closed by movement of window or door.

1,245,762. Alternating-Current Motor. A. H. Neuland, New York, N. Y. Arrangement of winding and starter and rotor parts whereby a single starter and tor may be controlled.

1,245,817. Flashlight Carrier. H. Suserud, Montreal, Can. Structure of pocket, etc.

1,245,823. Automatic Speed Regulator. S. Tompkins, New York, N. Y. Electro-pneumatic device for controlling prime movers.

1,245,830. Manual Tripping Mechanism for Igniters. H. R. Van Deventer, assignor to Splitdorf Electric Co., Newark, N. J. For use with internal combustion engines.

1,245,831 and 1,245,832. Tripping Mechanism for Igniters. H. R. Van Deventer, assignor to Splitdorf Electric Co. Modifications of above.

1,245,834. Synchronization of Machines for Recording and Reproducing Sounds and Movements. C. H. Verity, Leeds, England. For preparing sound records and moving-picture films.

1,245,853. Automobile-Signal. L. L. Zacharias, Wichita, Kans. Direction indicator.

1,245,855. Shade-Holder. E. G. K. Anderson, assignor to Anderson Electric Specialty Co., Chicago, Ill. For attachment to lamp bulb.

1,245,860. Electrically Driven Tool. S. D. Black and A. G. Decker, assignors to Black & Decker Mfg. Co., Baltimore, Md. Structure of motor-driven drill.

1,245,863. Electrical Fuse. R. C. Bronson, Chicago, Ill. Structure of inclosed type.

1,245,864. Automobile Signaling Device. R. S. Brown, Asheville, N. C. Direction indicator.

1,245,894. Telegraphic Receiving System. J. M. Fell, assignor to American Telephone & Telegraph Co. Special device having initial and second energizing circuits for the receiving apparatus.

1,245,900. Telephone Switching System. C. L. Goodrum, assignor to Western Electric Co. Manner of connecting in operators circuit and signaling cusrent.

1,245,929. Telephone. F. Lacroix, assignor one-half to A. M. Ketchum, New York, N. Y. Arrangement of ringing and talking circuits.

1,245,931. Spark-Plug Protector. G. R. Lanman, El Reno, Okla. A hood for upper portions of plug and adjacent feed wire.

1,245,940. Insulator. R. H. Marvin, assignor to R. Thomas & Sons Co., East Liverpool, O. Multi-unit structure of suspension type.

1,245,941. Stand for Electric Irons. W. E. Mayo, Hopewell, Va. For supporting an inverted iron on a table.

1,245,949. Electric Lamp Socket. A. H. Nero, assignor to Arrow Electric Co., Hartford, Conn. Candle socket fitting.

1,245,956. Electrical Measuring Apparatus. E. F. Northrup, assignor to Pyrolectric Instrument Co., Trenton, N. J. Modification of No. 1,245,609.

1,245,980. Insulating Compound and Process of Making the Same. S. Satow, Sendai, Japan. Glue-like mass of glutinized vegetable proteid, formaldehyde and a fibrous body.

1,245,993. Controlling Induction Motors. R. V. R. Sill, assignor one-third each to A. E. Pelham and G. L. McGill, New York, N. Y. Manner of controlling resistance in the phase windings.

Patents Expired.

The following United States electrical patents expired on November 20, 1917:

661,971. Control of Electric Motors. F. W. Garrett, Johnstown, Pa.

661,972. Controller for Electric Motors. F. W. Garrett, Johnstown, Pa.

661,975. Trolley. H. S. Goughnour, Johnstown, Pa.

661,986. Supporting Block or Bracket for Electric Fixtures. J. W. Heizer, Chicago, Ill.

661,988. Telephone Receiver. H. H. Hipwell, Allegheny, Pa.

662,009. Trolley. F. A. Merrick, Johnstown, Pa.

662,020. Means for Rapidly Transmitting Telegrams. A. Pollak and J. Virag, Budapest, Austria-Hungary.

662,021. Method for Rapidly Transmitting Telegrams. A. Pollak and J. Virag, Budapest, Austria-Hungary.

662,038. Controller. E. W. Stull, Johnstown, Pa.

662,039. Control of Electric Motors. E. W. Stull, Johnstown, Pa.

662,042. Dynamo-electric Machine. F. W. Throop, Niagara Falls, N. Y.

662,048. Electric Arc Lamp. J. J. Wood, Fort Wayne, Ind.

662,049. Automatic Circuit-breaking Apparatus. G. T. Woods, Monsey, N. Y.

662,156. Process of Gaging High Vacuums. J. Waring, Hartford, Conn.

662,312. Pole for Telegraphs, etc. E. W. Serrell, New York, N. Y.

662,315. Sparking Igniter for Explosive Engines. A. J. Signor, Elkhart, Ind.

662,316. Magneto-electric Machine. F. R. Simms, London, England, and R. Bosch, Stuttgart, Germany.

662,317. Electric Ignition Plug for Internal-combustion Engines. F. R. Sims, London, England.

662,369. Terminal Connection for Electric Lamps. A. J. Wurts, Pittsburgh, Pa.

662,375. Multiple-voltage Controller. G. S. Dunn, East Orange, N. J.

Financial News and Comment

FINANCING PUBLIC UTILITIES.

In a paper recently forcibly presented by T. H. Dudley Perkins, at the convention of the New Jersey Utility Association, held in Atlantic City, the subject of the financing of public utilities was discussed. This was in explanation of why increases in fares, etc., by electric railways should, where necessary, be promptly granted. Mr. Perkins told why at present investments are not being made in electric railroads' securities, as few are paying dividends and few are able to borrow money on bonds. He emphasized the fact that with the exception of where maturity is provided for by installment payments, as in car trust or equipment trust issues, etc., where a company puts aside out of its earnings each month or so, it becomes a question whether the Government should not consider the advisability of extending all maturing obligations for a period of more than one year. This at least during the period of war would prevent public service corporations from being embarrassed by this expensive and difficult problem of refinancing. Mr. Perkins suggested an act might be passed providing that creditors who will not voluntarily accept extensions of well secured maturing obligations, be compelled to do so. The chief feature considered in financing a public utility company, he stated, was its earning power and net earning power, and with the cost of labor, material and overhead advanced anywhere from 50 to 1000 per cent, it was important that the net earning power of public utilities be somewhere nearly maintained. The only solution he said was to increase the gross earnings more rapidly than they normally increase from growth of population, which meant a prompt granting by State Commissions of a fair increase in prices charged for electricity, gas, water or street railway service.

COPPER PRODUCTION AND EXPORTS.

The opinion voiced by copper officials is that the beginning of 1918 will see an increase in the base price of copper fixed by the Federal Board, owing to the scarcity of the metal, operating costs being much higher and an acute shortage of experienced miners. The efforts being made to increase production is meeting with success and good deliveries on old contracts by producers are being made. The world production of copper, which totaled less than 100,000 tons in 1850 and 130,000 tons in 1860, was 272,000 tons in 1890, 496,000 tons in 1900, 850,000 tons in 1910, 1,000,000 tons in 1913, and 1,400,000 tons in 1916.

The following table shows the exports of copper from the United States by months since January, 1914, in tons of 2,240 pounds:

	1917.	1916.	1915.	1914.
January	51,322	23,663	26,193	36,018
February	32,265	20,648	15,583	34,634
March	51,218	26,321	30,148	46,504
April	49,536	21,654	18,738	35,079
May	49,245	16,062	28,889	32,070
June	41,177	39,595	16,976	35,182
July	25,856	35,066	17,708	34,145
August	42,285	32,160	17,551	12,509
September	27,357	29,403	14,327	19,402
October	33,224	24,087	23,514	
November	22,598	23,168	24,999	
December	26,486	42,426	22,166	
Total	370,261	327,310	276,344	360,229

ADIRONDACK ELECTRIC POWER CORPORATION.

	1917.	1916.
September gross	$137,693	$124,725
Net after taxes	27,194	25,214
Surplus after bond interest	6,361	4,381
Twelve months' gross	1,596,047	1,481,711
Net after taxes	447,903	606,948
Surplus after bond interest	197,903	356,948

SAN JOAQUIN LIGHT & POWER COMPANY.

	1917.	1916.
September gross	$190,561	$151,027
Net after taxes	107,667	92,057
Surplus after interest charges	56,776	49,801
Nine months' gross	1,552,294	1,386,087
Net after taxes	903,472	851,221
Surplus after interest charges	483,534	473,188

NEW ENGLAND COMPANY POWER SYSTEM.

	1917.	1916.
September gross	$215,461	$165,725
Net after taxes	24,516	83,406
Deficit after charges	25,956	*32,729
Deficit after preferred dividends	58,553	*2,827
Nine months' gross	1,869,358	1,481,930
Net after taxes	840,001	935,114
Surplus after charges	391,650	485,429
Balance after preferred dividends	103,241	231,502

*Surplus.

APPALACHIAN POWER COMPANY.

	1917.	1916.
September gross	$ 87,439	$ 70,436
Net after taxes	46,853	43,255
Total income	47,138	43,708
Twelve months' gross	897,497	752,942
Net after taxes	517,169	407,367
Surplus after charges	43,401	32,458

HAVANA ELECTRIC RAILWAY, LIGHT & POWER COMPANY.

	1917.	1916.
September gross	$617,641	$507,562
Net after taxes	357,055	320,001
Surplus after charges	254,944	201,587
Nine months' gross	5,036,586	4,407,454
Net after taxes	2,851,117	2,714,828
Surplus after charges	1,830,800	1,660,101

LAKE SHORE ELECTRIC RAILWAY SYSTEM.

	1917.	1916.
September gross	$167,622	$152,529
Net after taxes	61,936	63,377
Surplus after charges	26,748	27,043
Nine months' gross	1,332,785	1,207,012
Net after taxes	441,362	453,884
Surplus after charges	129,835	126,578

NEWPORT NEWS & HAMPTON RAILWAY, GAS & ELECTRIC COMPANY.

	1917.	1916.
September gross	$129,810	$102,197
Net after taxes	57,567	47,969
Surplus after charges	37,189	28,639
Nine months' gross	939,101	780,825
Net after taxes	373,096	311,094
Surplus after charges	190,220	139,014

UTAH SECURITIES CORPORATION.

Earnings of subsidiaries, inter-company items eliminated, compare as follows:

	1917.	1916.
October gross	$596,108	$510,247
Net earnings	314,613	295,682
Twelve months' gross	6,405,669	5,450,233
Net earnings	3,451,948	3,014,518

UNITED NATIONAL UTILITIES.

	1917.	1916.
October gross	$1,113,687	$968,776
Ten months' gross	10,118,861	8,869,062

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid Nov. 13.	Bid Nov. 20.
Adirondack Electric Power of Glens Falls, common	..	13	17
Adirondack Electric Power of Glens Falls, preferred	6	62	67
American Gas & Electric of New York, common	10 +extra	95	85
American Gas & Electric of New York, preferred	6	40	40
American Light & Traction of New York, common	..	200	192
American Light & Traction of New York, preferred	6	93	90
American Power & Light of New York, common	4	30	33
American Power & Light of New York, preferred	6	68	67
American Public Utilities of Grand Rapids, common	..	24	24
American Public Utilities of Grand Rapids, preferred	6	58	57
American Telephone & Telegraph of New York	..	107	108
American Water Works & Elec. of New York, common	..	4	4
American Water Works & Elec. of New York, particip	7	10	9
American Water Works & Elec. of New York, first preferred	..	59	58
Appalachian Power of Bluefield, common	..	1	1½
Appalachian Power of Bluefield, preferred	7	20	15
Cities Service of New York, common	+extra	185	197
Cities Service of New York, preferred	6	75	72
Commonwealth Edison of Chicago	8	101½	102
Comm. Power, Railway & Light of Jackson, common	4	36	35
Comm. Power, Railway & Light of Jackson, preferred	6	64	61
Federal Light & Traction of New York, common	..	5	50
Federal Light & Traction of New York, preferred	..	30	30
Illinois Northern Utilities of Dixon	6	75	76
Middle West Utilities of Chicago, common	2+2 extra	28	28
Middle West Utilities of Chicago, preferred	6	55	55
Northern States Power of Chicago, common	ex div.7	58	52
Northern States Power of Chicago, preferred	ex div.7	87	85
Pacific Gas & Electric of San Francisco, common	5	36½	33
Pacific Gas & Electric of San Francisco, preferred	6	80	89
Public Service of Northern Illinois, Chicago, common	7	75	74½
Public Service of Northern Illinois, Chicago, preferred	6	88	89
Republic Railway & Light of Youngstown, common	4	19	18
Republic Railway & Light of Youngstown, preferred	6	55	55
Standard Gas & Electric of Chicago, common	..	5	3½
Standard Gas & Electric of Chicago, preferred	6	24	20
Tennessee Railway, Light & Power of Chattanooga, common	..	4½	2
Tennessee Railway, Light & Power of Chattanooga, preferred	6	10	9
United Light & Railways of Grand Rapids, common	4	25	24
United Light & Railways of Grand Rapids, preferred	6	57	59
Western Power of San Francisco, common	..	7	7
Western Power of San Francisco, preferred	6	44	40
Western Union Telegraph of New York	extra	..	83
Industrials—			
Electric Storage of Philadelphia, common	4	47½	47½
General Electric of Schenectady	8	122	129¾
National Carbon of Cleveland, common	8	56	56
National Carbon of Cleveland, preferred	..	120	130
Westinghouse Electric & Mfg. of Pittsburgh, common	5+extra	38¼	38¾
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	56	56

*Last sale.